

Steel Vessels
1998-1999

PART 1 Classification, Testing and Surveys

# OUT ISSION

The mission of ABS® is to serve the public interest as well as the needs of our clients by promoting the security of life, property and the natural environment primarily through the development and verification of standards for the design, construction and operational maintenance of marine-related facilities.

# quality L I C Y

It is the policy of ABS to provide quality services in support of our mission and to be responsive to the individual and collective needs of our clients as well as those of the public at large.

All of our client commitments, supporting actions, and services delivered must be recognized as expressions of quality.

We pledge to monitor our performance as an on-going activity and to strive for continuous improvement.





Rules for Building and Classing Steel Vessels

Part 1 Classification, Testing and Surveys

1998-1999

American Bureau of Shipping Incorporated by Act of the Legislature of and State of New York 1862

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# Part 1

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#### Classification, Testing and Surveys

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# Rule Change Notice

### 1998

**Table 1** shows subsection/paragraph numbers of all changes in **PART 1** during the last year arranged in the order of the effective date of each group of changes. The effective date of each change is also shown in parenthesis within the text of the Rules at the end of the subsection/

paragraph title. Unless a particular date and month are shown, 1998 refers to 13 May 1998, 1997 refers to 19 May 1997, 1996 refers to 9 May 1996, 1995 refers to 15 May 1995, 1994 refers to 9 May 1994 and 1993 refers to 11 May 1993 effective date.

#### Table 1

### Listing by Effective Dates of Changes in PART 1 from the 1997 Rules

#### EFFECTIVE DATE 13 MAY 1998

	(Based on the contract date for construct	•
Reg. No.	Title/Subject	Status/Remarks
1/1.2	Suspension and Cancellation	Revised-As approved by
	of Classification	Classification Committee on
		23 April '98
1/2.1	Testing of Tanks and Tight	Revised
	Boundaries	
1/2.2	(Tank Tests for Structural	Deleted
	Adequacy)	
Table 1/2.1	Testing Requirements for	Revised
	Tanks and Boundaries	
Table 1/2.2	Additional Testing	New
	Requirements for Vessels or	
	Tanks of Special Service	
1/3.5.5b	Special Periodical Surveys-	Revised-old 1/3.1.5b
	Commencement	
1/3.5.7a	Continuous Surveys	Revised-old 1/3.1.6a
1/3.5.11b	Underwater Inspection in lieu	Revised-old 1/3.2.1b
	of Drydocking Survey	
1/3.5.17a1	Water-tube Boilers for	Revised-old 1/3.15.1a1
	Propulsion	
1/3.5.17e	Auxiliary Boiler	Revised-old 1/3.15.1c
1/3.7.1i	Annual Surveys—Hull—Parts	Revised-old 1/3.3.1i1 & 2
	to be Examined	
1/3.7.7	Drydocking Surveys	Revised-old 1/3.2.1c
1.3.7.9f3	Special Periodical Survey—	Revised-old 1/3.7.1f3
	Hull-Parts to be Examined	
1/3.7.9m	Special Periodical Survey—	Revised-old 1/3.7.1m3
	Hull-Parts to be Examined	
1/3.9.1a & Note	Annual Surveys—Machinery-	Revised
	Parts to be Examined	
1/3.9.1i	Annual Surveys—Machinery-	Revised
	Parts to be Examined	
1/3.9.5b	Steam Turbines	<i>Revised</i> -old 1/3.11.3

1/3.10	(Survey of Fire Extinguishing	Deleted-See Note in 1/3.9.1i
1/3.23.1b2, 3, 4, 5, 8, 9, 11, 14, 19	System Components) Vessels Intended to Carry Liquefied Gases-Annual Survey	Revised
1/3.23.3a5, 13	Vessels Intended to Carry Liquefied Gases-Special Periodical Surveys	Revised-old 1/3.23.3a6, 14
Table 1/3.2, Note 3	Min. Req. for Thickness Gaugings at Special Periodical Surveys of Tankers without ESP Notation	Revised
Table 1/3.3, Note 3	Min. Req. for Thickness Gaugings for Dry Cargo Vessels	Revised
Appendix 1/B 1/B.2.5.2	Hull Surveys of Tankers -Extent of Thickness Measurement	Revised
1/B.2.5.4	-Extent of Thickness Measurement	
1/B.4.5.1	-Examination of Ballast Tanks	
1/B.4.5.2	-Examination of Ballast Tanks	
Table 1/B.2, Note 3	-Req. for Thickness Measurement at Special Survey of Oil Tankers, Ore/Oil Ships, etc.	
Appendix 1/C	Hull Surveys of Bulk Carriers	Revised
1/C.1.3.3	-Scope of Surveys	
1/C.2.5.3	-Extent of Overall and Close-	
	up Survey	
1/C.3.2.3.4	-Cargo Holds	
1/C.4.5.1	-Examination of Ballast Tanks	
1/C.4.5.2	-Examination of Ballast Tanks	
Table 1/C.2, Note 3	-Req. for Thickness	
	Measurement at Special	
	Survey of Bulk Carriers	
Appendix 1/D	Hull Surveys of Chemical Tankers	Revised
1/D.2.3.1	-Tank Protection	
1/D.2.5.2	-Extent of Thickness	
	Measurement	
1/D.2.5.4	-Extent of Thickness	
	Measurement	
1/D.4.5.1	-Examination of Ballast Tanks	
1/D.4.5.2	-Examination of Ballast Tanks	
Table 1/D.2, Note 3	-Req. of Thickness	
	Measurements at Special Survey of Chemical Tankers	

Note: Section 3 in Part 1 has been editorially re-arranged for the 1998-1999 Rules from the 1997 Rules for clarity purposes and to make the Rules more user friendly. Where the paragraph numbers have changed due to the rearrangement, the referenced "old" paragraph numbers are those referenced in the 1997 edition of the Rules.

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### Part 1 Section 1

# Scope and Conditions of Classification

#### 1/1.1 Classification

#### **1/1.1.1 Process** (1 Jan. '96)

The Classification process consists of a) the development of rules, guides, standards and other criteria for the design and construction of marine vessels and structures, for materials, equipment and machinery, b) the review of design and survey during and after construction to verify compliance with such rules, guides, standards or other criteria, c) the assignment and registration of class when such compliance has been verified, and d) the issuance of a renewable Classification certificate, with annual endorsements, valid for five years.

The Rules and standards are developed by Bureau staff and passed upon by committees made up of naval architects, marine engineers, shipbuilders, engine builders, steel makers and by other technical, operating and scientific personnel associated with the worldwide maritime industry. Theoretical research and development, established engineering disciplines, as well as satisfactory service experience are utilized in their development and promulgation. The Bureau and its committees can act only upon such theoretical and practical considerations in developing Rules and standards.

For classification, vessels are to comply with both the hull and the machinery requirements of the Rules.

#### 1/1.1.2 Certificates and Reports (1 Jan. '96)

- a Plan review and surveys during and after construction are conducted by the Bureau to verify to itself and its committees that a vessel, structure, item of material, equipment or machinery is in compliance with the Rules, Guides, standards or other criteria of the Bureau and to the satisfaction of the attending surveyor. All reports and certificates are issued solely for the use of the Bureau, its committees, its clients and other authorized entities.
- b The Bureau will release information from reports and certificates to the Port State to assist in rectification of deficiencies during port state control intervention. Such information includes text of conditions of classification, survey due dates, and certificate expiration dates. The owner will be advised of any request and/ or release of information.
- c The Bureau will release certain information to the vessel's hull underwriters and P&I clubs for underwriting purposes. Such information includes text of overdue conditions of classification, survey due dates, and certificate expiration dates. The owners will be advised of any request and/or release of information. In the case of overdue conditions of classification, the owners will be given the opportunity to verify the accuracy of the information prior to release.

#### 1/1.1.3 Representations as to Classification

Classification is a representation by the Bureau as to the structural and mechanical fitness for a particular use or service in accordance with its Rules and standards. The Rules of American Bureau of Shipping are not meant as a substitute for the independent judgement of professional designers, naval architects, marine engineers, owners, operators, masters and crew nor as a substitute for the quality control procedures of shipbuilders, engine builders, steel makers, suppliers, manufacturers and sellers of marine vessels, materials, machinery or equipment. The Bureau, being a technical society, can only act through Surveyors or others who are believed by it to be skilled and competent.

The Bureau represents solely to the vessel Owner or client of the Bureau that when assigning class it will use due diligence in the development of Rules, Guides and standards, and in using normally applied testing standards, procedures and techniques as called for by the Rules, Guides, standards or other criteria of the Bureau for the purpose of assigning and maintaining class. The Bureau further represents to the vessel Owner or other client of the Bureau that its certificates and reports evidence compliance only with one or more of the Rules, Guides, standards or other criteria of the Bureau in accordance with the terms of such certificate or report. Under no circumstances whatsoever are these representations to be deemed to relate to any third party.

#### 1/1.1.4 Scope of Classification

Nothing contained in any certificate or report is to be deemed to relieve any designer, builder, Owner, manufacturer, seller, supplier, repairer, operator, other entity or person of any warranty express or implied. Any certificate or report evidences compliance only with one or more of the Rules, Guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or other authorized entities. Nothing contained in any certificate, report, plan or document review or approval is to be deemed to be in any way a representation or statement beyond those contained in 1/1.1.3. The validity, applicability and interpretation of any certificate, report, plan or document review or approval are governed by the Rules and standards of American Bureau of Shipping who shall remain the sole judge thereof. The Bureau is not responsible for the consequences arising from the use by other parties of the Rules, Guides, standards or other criteria of the American Bureau of Shipping, without review, plan approval and survey by the Bureau.

The term "approved" shall be interpreted to mean that the plans, reports or documents have been reviewed for compliance with one or more of the Rules, Guides, standards, or other criteria of the Bureau.

The Rules are published on the understanding that responsibility for stability and trim, for reasonable handling

and loading, as well as for avoidance of distributions of weight which are likely to set up abnormally severe stresses in vessels does not rest upon the Committee.

# 1/1.2 Suspension and Cancellation of Classification (1998)

#### 1/1.2.1 General

The continuance of the Classification of any vessel is conditional upon the Rule requirements for periodical, damage and other surveys being duly carried out. The Committee reserves the right to reconsider, withhold, suspend, or cancel the class of any vessel or any part of the machinery for noncompliance with the Rules, for defects reported by the Surveyors which have not been rectified in accordance with their recommendations, or for nonpayment of fees which are due on account of Classification, Statutory or Cargo Gear Surveys. Suspension or cancellation of class may take effect immediately or after a specified period of time.

#### 1/1.2.2 Notice of Surveys

It is the responsibility of the owner to ensure that all surveys necessary for the maintenance of class are carried out at the proper time. The Bureau will notify an owner of upcoming surveys and outstanding recommendations. This may be done by means of a letter, a quarterly vessel status or other communication. The non-receipt of such notice, however, does not absolve the owner from his responsibility to comply with survey requirements for maintenance of class.

#### 1/1.2.3 Special Notations

If the survey requirements related to maintenance of special notations are not carried out as required, the suspension or cancellation may be limited to those special notations only.

#### 1/1.2.4 Suspension of Class

- a Class will be suspended and the Certificate of Classification will become invalid, from the date of any use, operation, loading condition, or other application of any vessel for which it has not been approved and which affects or may affect classification or the structural integrity, quality or fitness for a particular use or service.
- b Class will be suspended and the Certificate of Classification will become invalid in any of the following circumstances:
  - 1 if recommendations issued by the Surveyor are not carried out by their due dates and no extension has been granted,
  - 2 if Continuous Survey items which are due or overdue at the time of Annual Survey are not completed and no extension has been granted,
  - 3 if the periodical surveys required for maintenance of class, other than Annual, Intermediate or Special Surveys, are not carried out by the due date and no Rule allowed extension has been granted, or
  - 4 if any damage, failure, deterioration, or repair has not been completed as recommended.
- c Class may be suspended, in which case the Certificate of Classification will become invalid, if proposed repairs as referred to in 1/3.1.1 have not been submitted

- to the Bureau and agreed upon prior to commencement.
- d Class is automatically suspended and the Certificate of Classification is invalid in any of the following circumstances:
  - 1 if the Annual Survey is not completed by the date which is three (3) months after the due date,
  - 2 if the Intermediate Survey is not completed by the date which is three (3) months after the due date of the third Annual Survey of the five (5) year periodic survey cycle, or
  - 3 if the Special Survey is not completed by the due date, unless the vessel is under attendance for completion prior to resuming trading. Under exceptional circumstances, consideration may be given for an extension of the Special Survey,
    - a provided the vessel is attended and the attending Surveyor so recommends; such an extension shall not exceed three (3) months, or
    - **b** if the vessel is at sea on the Special Survey due date, and there is documented agreement to an extension prior to the due date, positive arrangements have been made for a Surveyor to attend the vessel at the first port of call, and the Bureau is satisfied there is technical justification for an extension; such an extension shall be granted only until arrival at the first port of call after the due date.

#### 1/1.2.5 Lifting of Suspension

- **a** Class will be reinstated after suspension for overdue surveys, upon satisfactory completion of the overdue surveys. Such surveys will be credited as of the original due date.
- **b** Class will be reinstated after suspension for overdue recommendations, upon satisfactory completion of the overdue recommendation.
- **c** Class will be reinstated after suspension for overdue continuous survey items, upon satisfactory completion of the overdue items.

#### 1/1.2.6 Cancellation of Class

- **a** If the circumstances leading to suspension of class are not corrected within the time specified, the vessel's class will be canceled.
- **b** A vessel's class is canceled immediately when a vessel proceeds to sea without having completed recommendations which were required to be dealt with before leaving port.
- c When class has been suspended for a period of three (3) months due to overdue Annual, Intermediate, Special, or other periodical surveys required for maintenance of class; overdue Continuous Survey items; or overdue outstanding recommendations, class will be canceled. A longer suspension period may be granted for vessels which are either laid up, awaiting disposition of a casualty, or under attendance for reinstatement.

# 1/1.2.7 Alternative Procedures for Certain Types of Vessels

Alternatives to subparagraph 1/1.2.4d procedures for automatic suspension of class and subparagraph 1/1.2.6c proce-

dures for cancellation of class, may be applied to military vessels; commercial vessels owned or chartered by governments which are utilized in support of military operations or service; or laid-up vessels.

#### 1/1.3 Classification Symbols

#### 1/1.3.1 Unrestricted Service

Vessels which have been built to the satisfaction of the Surveyors to the Bureau to the full requirements of the Rules, or to their equivalent, where approved by the Committee for unrestricted ocean service at the assigned free-boards, will be classed and distinguished in the Record by the symbols \$\mathbb{A}\$ Al indicating compliance with the hull requirements of the Rules and for self-propelled vessels \$\mathbb{A}\$ AMS indicating compliance with the machinery requirements of the Rules.

#### 1/1.3.2 Special Rules

Vessels which have been built to the satisfaction of the Surveyors to the Bureau to the requirements as contained in the Rules for special types of vessels and which are approved by the Committee for unrestricted ocean service at the assigned freeboards, will be classed and distinguished in the Record by the symbols # A1 followed by the appropriate notation, such as Oil Carrier, Ore Carrier, Bulk Carrier, Ore or Oil Carriers, Oil or Bulk/Ore (OBO) Carrier, Passenger Vessel, Vehicle Carrier, Container Carrier, Towing Vessel, Refrigerated Cargo Carrier.

#### 1/1.3.3 Special Purpose Vessels

Vessels of special design, intended primarily for ferry service, for dredging, for fishing, etc., which have been built to the satisfaction of the Surveyors to the Bureau to arrangements and scantlings approved for the particular purpose, where approved by the Committee for unrestricted ocean service at the assigned freeboards, will be classed and distinguished in the Record by the symbols ♣ A1 followed by a designation of the trade for which special modifications to the Rules have been approved.

#### 1/1.3.4 Geographical Limitations

Vessels which have been built to the satisfaction of the Surveyors to the Bureau to special modified requirements for a limited service, where approved by the Committee for that particular service, will be classed and distinguished in the Record by the symbols and notations as described in 1/1.3.1, 1/1.3.2, and 1/1.3.3 above, but the symbols and notations will either be followed by or have included in them the appropriate service limitation.

#### 1/1.3.5 Vessels Not Built under Survey

Vessels which have not been built under survey to this Bureau, but which are submitted for classification, will be subjected to a special classification survey. Where found satisfactory and thereafter approved by the Committee, they will be classed and distinguished in the Record by the symbols and special notations as described in 1/1.3.1 to 1/1.3.4 above, but the mark ♣ signifying the survey during construction will be omitted.

#### 1/1.3.6 Equipment Symbol

The symbol © placed after the symbols of classification, thus: lambda A1© will signify that the equipment of anchors

and chain cables of the vessel is in compliance with the requirements of the Rules, or with requirements corresponding to the service limitation noted in the vessel's classification, which have been specially approved for the particular service.

#### **1/1.3.7 ♣ AMS Symbols**

Machinery and boilers which have been constructed and installed to the satisfaction of the Surveyors to the Bureau to the full requirements of the Rules, when found satisfactory after trial and approved by the Committee, will be classed and distinguished in the Record by the symbols # AMS.

#### 1/1.3.8 AMS Symbols

Machinery and boilers which have not been constructed and installed under survey to this Bureau, but which are submitted for classification, will be subjected to a special classification survey. Where found satisfactory and thereafter approved by the Committee, they will be classed and distinguished in the Record by the symbols AMS.

#### 1/1.3.9 Centralized or Automatic Control Systems

Where, in addition to the individual unit controls, it is proposed to provide remote, centralized, or automatic control systems for propulsion units, essential auxiliaries, or for cargo handling, relevant data is to be submitted to permit the assessment of the effect of such systems on the safety of the ship. All controls necessary for the safe operation of the vessel are to be proved to the Surveyor's satisfaction. The automatic and remote-control systems are to be in accordance with the applicable requirements of Section 4/11.

#### 1/1.3.10 Dynamic Loading Approach

Vessels which have been built to plans reviewed in accordance with an acceptable procedure and criteria for calculating and evaluating the behavior of hull structures under dynamic loading conditions, in addition to full compliance with other requirements of the Rules, will be classed and distinguished in the Record by the notation DLA placed after the appropriate hull classification notation. See also 3/2.3.3. The application of the dynamic loading approach will be optional.

#### 1/1.3.11 SafeHull Criteria (1996)

Vessels designed and built to the requirements in Section 5/2A, for tankers and Section 5/3A, for bulk carriers, will be identified in the Record by the notation SH.

#### 1/1.3.12 Ice Class (1998)

Vessels to be distinguished in the Record by the notation Ice Strengthening, followed by an ice class designation are to meet the requirements in Part 5 Section 1 applicable to the designated ice class.

#### 1/1.5 Rules For Classification

#### **1/1.5.1 Application of Rules** (1997)

These Rules are applicable to steel vessels of 90 m 295 ft) and over in length intended for unrestricted ocean service, except where specifically mentioned otherwise. For smaller

vessels, refer to the "Rules for Building and Classing Steel Vessels Under 90 Meters (295 Feet) in Length."

These requirements are applicable to those features that are permanent in nature and can be verified by plan review, calculation, physical survey or other appropriate means. Any statement in the Rules regarding other features is to be considered as a guidance to the designer, builder, owner, et al.

#### 1/1.5.2 Alternatives

#### a General

The Committee is at all times ready to consider alternative arrangements and scantlings which can be shown, through either satisfactory service experience or a systematic analysis based on sound engineering principles, to meet the overall safety and strength standards of the Rules.

#### **b** National Regulations

The Committee will consider special arrangements or details of hull, equipment or machinery which can be shown to comply with standards recognized in the country in which the vessel is registered or built, provided they are not less effective.

#### c Other Rules

The Committee will consider hull, equipment or machinery built to the satisfaction of the Surveyors of the Bureau in accordance with the plans that have been approved to the Rules of another recognized classification society with verification of compliance by the Bureau. A notation will be entered in the Record indicating that classification has incorporated the provisions of this subparagraph. Submission of plans is to be in accordance with 1/1.9.

#### 1/1.5.3 Novel Features

Vessels which contain novel features of design in respect of the hull, machinery, or equipment to which the provisions of the Rules are not directly applicable may be classed, when approved by the Committee, on the basis that the Rules insofar as applicable have been complied with and that special consideration has been given to the novel features based on the best information available at the time.

#### 1/1.5.4 Effective Date of Rule Change

#### a Six Month Rule

Changes to the Rules are to become effective six months from the date on which The Technical Committee approves them. However, the Bureau may bring into force individual changes before that date if necessary or appropriate.

#### **b** Implementation of Rule Changes

In general, until the effective date, plan approval for designs will follow prior practice unless review under the latest Rules is specifically requested by the party signatory to the application for classification. If one or more vessels are to be constructed from plans previously approved, no retroactive application of the subsequent Rule changes will be required except as

may be necessary or appropriate for all contemplated construction.

#### 1/1.7 Other Regulations

#### 1/1.7.1 General

While the Rules cover the requirements for the classification of new vessels, the attention of Owners, designers, and builders is directed to the regulations of international, governmental, canal, and other authorities dealing with those requirements in addition to or over and above the classification requirements.

#### 1/1.7.2 International Conventions or Codes

Where authorized by the Administration of a country signatory thereto and upon request of the Owners of a classed vessel or one intended to be classed, the Bureau will survey a new or existing vessel for compliance with the provisions of International Conventions and Codes including the following, and certify thereto in the manner prescribed in the Convention or Code.

International Convention on Load Lines, 1966.

International Convention for the Safety of Life at Sea, 1974, as amended.

International Convention on Tonnage Measurement of Ships, 1969.

International Convention for the Prevention of Pollution from Ships, 1973/78, as amended.

International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk.

International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk.

#### 1/1.7.3 Governmental Regulations

Where authorized by a government agency and upon request of the owners of a classed vessel or one intended to be classed, the Bureau will survey and certify a new or existing vessel for compliance with particular regulations of that government on their behalf.

#### 1/1.8 IACS Audit (1995)

The International Association of Classification Societies (IACS) conducts audits of processes followed by all its member societies to assess the degree of compliance with the IACS Quality System Certification Scheme requirements. For this purpose, auditors from IACS may accompany ABS personnel at any stage of the classification or statutory work which may necessitate the auditors having access to the vessel or access to the premises of the manufacturer or shipbuilder.

In such instances, prior authorization for the auditor's access will be sought by the local ABS office.

#### 1/1.9 Submission of Plans

#### 1/1.9.1 **Hull Plans**

Plans showing the scantlings, arrangements, and details of the principal parts of the hull structure of each vessel to be built under survey are to be submitted and approved before the work of construction is commenced. These plans are to indicate clearly the scantlings and details of welding, and they are to include such particulars as the design draft and design speed. Where provision is to be made for any special type of cargo or for any exceptional conditions of loading, whether in ballast or with cargo, particulars of the weights to be carried and of their distribution are also to be given. In general the following plans are to be submitted for review or reference. See also 3/2.1.1.d.

Vessel Specifications General Arrangement

Midship section

Scantling profile and decks

Bottom construction, floors, girders, etc.

Framing plan

Inner bottom plating

Shell expansion

Deck plans

Pillars and girders

Watertight and deep-tank bulkheads

Miscellaneous nontight bulkheads which are used as structural supports

Shaft tunnels

Machinery casings, boiler, engine and main auxiliary foundations

Bow framing

Stem

Stern framing

Stern frame and rudder

Shaft struts

Spectacle frames and bossing details

Superstructures and deckhouses, and their closing arrangements

Hatches and hatch-closing arrangements Ventilation system on weather decks

Anchor handling arrangements

Lines and body plan

Capacity plan

Docking plan

Plans should generally be submitted in triplicate, one copy to be returned to those making the submission, one copy for the use of the Surveyor where the vessel is being built, and one copy to be retained in the ABS Technical office for record. Additional copies may be required where the required attendance of the Surveyor is anticipated at more than one location

#### 1/1.9.2 Machinery Plans

Plans showing the boiler, main propulsion engine, reduction gear, shafting and thrust bearing foundations (see 3/19.1), including holding-down bolts; also machinery general arrangement, installation and equipment plans as referenced in 4/1.5.1, are to be submitted and approved before proceeding with the work.

#### 1/1.9.3 Additional Plans

Where certification under 1/1.7.2 or 1/1.7.3 is requested, submission of additional plans and calculations may be required.

#### 1/1.11 Conditions For Surveys After Construction

#### 1/1.11.1 Damage, Failure and Repair (1 Jan. '96)

a *Examination and Repair* Damage, failure, deterioration or repair to hull, machinery or equipment, which

affects or may affect classification, is to be submitted by the Owners or their representatives for examination by a Surveyor at first opportunity. All repairs found necessary by the Surveyor are to be carried out to the Surveyor's satisfaction.

**b** Repairs Where repairs to hull, machinery or equipment, which affect or may affect classification, are planned in advance to be carried out, a complete repair procedure including the extent of proposed repair and the need for Surveyor's attendance is to be submitted to and agreed upon by the Bureau reasonably in advance. Failure to notify the Bureau, in advance of the repairs, may result in suspension of the vessels' classification until such time as the repair is redone or evidence submitted to satisfy the Surveyor that the repair was properly carried out.

Note: The above applies also to repairs during voyage.

The above is not intended to include maintenance and overhaul to hull, machinery and equipment in accordance with the recommended manufacturer's procedures and established marine practice and which does not require Bureau approval; however, any repair as a result of such maintenance and overhauls which affects or may affect classification is to be noted in the ship's log and submitted to the Surveyor as required by 1/1.11.1a.

**c** *Representation* Nothing contained in this section or in a rule or regulation of any government or other administration, or the issuance of any report or certificate pursuant to this section or such a rule or regulation, is to be deemed to enlarge upon the representations expressed in 1/1.1.1 through 1/1.1.4 hereof and the issuance and use of any such reports or certificates are to be governed in all respects by 1/1.1.1 through 1/1.1.4 hereof.

# 1/1.11.2 Notification and Availability for Survey $(1 \ Jan. \ ^396)$

The Surveyors are to have access to classed vessels at all reasonable times. For the purpose of Surveyor Monitoring, monitoring Surveyors shall also have access to classed vessels at all reasonable times. Such access may include attendance at the same time as the assigned Surveyor or during a subsequent visit without the assigned Surveyor. The Owners or their representatives are to notify the Surveyors on all occasions when a vessel can be examined in dry dock or on a slipway.

The Surveyors are to undertake all surveys on classed vessels upon request, with adequate notification, of the Owners or their representatives and are to report thereon to the Committee. Should the Surveyors find occasion during any survey, to recommend repairs or further examination, notification is to be given immediately to the Owners or their representatives in order that appropriate action may be taken. The Surveyors are to avail themselves for every convenient opportunity for carrying out periodical surveys in conjunction with surveys of damages and repairs in order to avoid duplication of work.

# 1/1.11.3 Attendance at Port State Request $(1 Jan. ^96)$

It is recognized that Port State authorities legally may have access to a vessel. In cooperation with Port States, ABS Surveyors will attend on board a classed vessel when so requested by a Port State, and upon concurrence by the

vessel's master will carry out a survey in order to facilitate the rectification of reported deficiencies or other discrepancies that affect or may affect classification. ABS Surveyors will also cooperate with Port States by providing inspectors with background information, if requested. Such information includes text of conditions of class, survey due dates, and certificate expiration dates.

Where appropriate, the vessel's flag state will be notified of such attendance and survey.

#### 1/1.13 Fees

Fees in accordance with normal ABS practice will be charged for all services rendered by the Bureau. Expenses incurred by the Bureau in connection with these services will be charged in addition to the fees. Fees and expenses will be billed to the party requesting that particular service.

#### 1/1.15 Disagreement

#### 1/1.15.1 Rules

Any disagreement regarding either the proper interpretation of the Rules, or translation of the Rules from the English language edition, is to be referred to the Bureau for resolution.

#### **1/1.15.2** Surveyors

In case of disagreement between the Owners or builders and the Surveyors regarding the material, workmanship, extent of repairs, or application of the Rules relating to any vessel classed or proposed to be classed by this Bureau, an appeal may be made in writing to the Committee, who will order a special survey to be held. Should the opinion of the Surveyor be confirmed, the expense of this special survey is to be paid by the party appealing.

#### 1/1.17 Limitation of Liability

The combined liability of American Bureau of Shipping, its committees, officers, employees, agents or subcontractors for any loss, claim, or damage arising from its negligent performance or nonperformance of any of its services or from breach of any implied or express warranty of workmanlike performance in connection with those services, or from any other reason, to any person, corporation, partnership, business entity, sovereign, country or nation, will be limited to the greater of a) \$100,000 or b) an amount equal to ten times the sum actually paid for the services alleged to be deficient.

The limitation of liability may be increased up to an amount twenty-five times that sum paid for services upon receipt of Client's written request at or before the time of performance of services and upon payment by Client of an additional fee of \$10.00 for every \$1,000.00 increase in the limitation.

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### Part 1 Section 2

# Testing and Trials During Construction—Hull

# 1/2.1 Testing of Tanks and Tight Boundaries (1998)

#### 1/2.1.1 General (1998)

- a *Application* All tanks, including independent tanks of 5 m<sup>3</sup> (176 ft<sup>3</sup>) or more in capacity, and other boundaries required to be watertight or weathertight are to be tested in accordance with this subsection and proven tight or structurally adequate as follows:
  - 1 Gravity Tanks for their structural adequacy and tightness,
  - 2 Watertight Boundaries Other Than Tank Boundaries for their watertightness, and
- 3 Weathertight Boundaries for their weathertightness. For the testing of cargo containment systems of liquefied gas carriers, the requirements in 5/4A.4.10 will apply.

#### **b** Definitions

- 1 Structural Testing is a test to verify the structural adequacy of the design and the tightness of the tanks.
- 2 Air Testing is a test to verify the tightness of the structure by means of air pressure difference.
- 3 *Hose Testing* is a test to verify the tightness of the structure by a jet of water.
- 4 *Hydropneumatic Testing* is a combined hydrostatic and air testing wherein a tank is filled by water with air pressure applied on top.
- 5 Hydrostatic Testing is a test to verify the structural adequacy of the design and the tightness of the tanks structures by means of water pressure, by filling water to the level as specified in Table 1/2.1. Hydrostatic testing is the normal means for structural testing with exception as per 1/2.1.2b

#### 1/2.1.2 Test Procedures (1998)

a *General* Tests are to be carried out in the presence of the Surveyor at a stage sufficiently close to completion, after all attachments, outfittings or penetrations which may affect the strength or tightness of the structure have been competed, and before any ceiling and cement work is applied over joints.

Specific test requirements are given in 1/2.1.3 and Table 1/2.1. For vessels or tanks of special service, additional requirements are given in Table 1/2.2.

For the timing of application of coating in relation to testing, see 1/2.1.4.

**b** *Structural Testing* Where structural testing is specified by Table 1/2.1 or Table 1/2.2, hydrostatic testing in accordance with 1/2.1.3a will be acceptable, except where practical limitations prevent it or where air testing is permitted by Note 1 to Table 1/2.1. Hydropneumatic testing in accordance with 1/2.1.3b may be approved in lieu of hydrostatic testing. Structural testing may be carried out after the vessel is launched.

Tank boundaries are to be tested at least from one side. Tanks to be tested for structural adequacy (see Note 1 to Table 1/2.1) are to be selected so that all representative structural members are tested for the expected tension and compression.

- **c** *Air Testing* Air testing is to be in accordance with 1/2.1.3c.
- **d** *Hose Testing* Hose testing is applied to structures not subjected to structural or air testing but are required to be watertight or weathertight as specified in Table 1/2.1. For the details of hose testing, see 1/2.1.3d. Air testing or structural testing may be accepted in lieu of hose testing.

#### 1/2.1.3 **Details of Testing** (1998)

- a *Hydrostatic Testing* Hydrostatic testing is to consist of a head of water to the level specified in Table 1/2.1.
- **b** *Hydropneumatic Testing* When approved, the combined water level and air pressure used for hydropneumatic testing is to simulate the actual loading as far as practicable. The requirements and recommendations in 1/2.1.3c relative to air pressure will also apply.
- 2.1.3c relative to air pressure will also apply. **c** Air Testing All boundary welds, erection joints, and penetrations including pipe connections are to be examined in accordance with the approved procedure and under a pressure differential not less than 0.15 bar (0.15 kgf/cm2, 2.2 psi) with a leak indicating solution.

It is recommended that the air pressure in the tank be raised to and maintained at 0.20 bar (0.20 kgf/cm2, 2.9 psi) for approximately one hour, with a minimum number of personnel around the tank, before being lowered to the test pressure.

A U-tube with a height sufficient to hold a head of water corresponding to the required test pressure is to be arranged. The cross sectional area of the U-tube is to be not less than that of the pipe supplying air. In addition to U-tube, a master gauge or other approved means is to be provided to verify the pressure.

Other effective methods of air testing, including compressed air fillet weld testing or vacuum testing, may be considered in accordance with 1/2.1.3e.

- **d** *Hose Testing* Hose testing is to be carried out with the pressure in the hose of at lease 2 bar (2 kgf/cm2, 30 psi) during test. The nozzle is to have minimum inside diameter of 12 mm (0.5 in.) and located at a distance to the joint not exceeding 1.5 m (5 ft).
- e *Other Methods of Testing* Other methods of testing may be considered upon submission of full particulars.

#### 1/2.1.4 Application of Coating (1998)

#### a Final Coating

- 1 Structural Testing Final coating may be applied prior to the hydrostatic testing provided an air test is carried out before the application of final coating.
- 2 Air Testing For all manual or semi-automatic erection welds and all fillet weld tank boundary connections including penetrations, final coating is to be applied after air testing. For other welds, final coating may

be applied prior to air testing provided the Surveyor, after examination prior to the application of coating, is satisfied with the weld. The Surveyor reserves a right to require air testing prior to the final coating of automatic erection welds and manual or automatic pre-erection welds.

- 3 *Hose Testing* Final coating is to be applied after all required hose testing is completed.
- **b** *Temporary Coating* Any temporary coating which may conceal defects or leaks is to be applied as specified for final coating. This requirement does not apply to shop primer applied before fabrication.

#### 1/2.2 (No text)

#### 1/2.3 Anchor Windlass Trials

Each anchor windlass is to be tested under normal working conditions to demonstrate satisfactory operation. Each required anchor handling unit, independently, is to be tested for braking, clutch functioning, power lowering, hoisting, and proper riding of the chain through the hawsepipe, over the wildcat (chain wheel), through the chain pipe, and stowing in the chain locker. Also, it is to be demonstrated that the windlass is capable of lifting each anchor with 82.5 m (45 fathoms) length of chain submerged and hanging free. Where the available water depth is insufficient, the proposed test method will be specially considered.

#### 1/2.4 Bilge System Trials

All elements of the bilge system are to be tested to demonstrate satisfactory pumping operation, including emergency suctions and all controls. Upon completion of the trials, the bilge strainers are to be opened, cleaned and closed up in good order.

#### 1/2.5 Steering Trials

Refer to Section 4/8.13 for technical details of the steering trials.

#### 1/2.6 Construction Welding and Fabrication

For surveys of hull construction welding and fabrication, refer to Section 2/3 and the ABS "Rules for Nondestructive Inspection of Hull Welds".

#### 1/2.7 Hull Castings and Forgings

For surveys in connection with the manufacture and testing of hull castings and forgings, refer to Section 2/1.

#### 1/2.8 Hull Piping

For surveys in connection with the manufacture and testing of hull piping, refer to Section 4/6.

TABLE 1/2.1 Testing Requirements for Tanks and Boundaries (1998)

	Structures to be Tested	Type of Testing	Hydrostatic Testing Head or Pressure	Remarks
1	Double Bottom Tanks	Structural <sup>1,2</sup>	The greater of —to the top of overflow, or —to the bulkhead deck	
2	Double Side Tanks	Structural <sup>1,2</sup>	The greater of —to the top of overflow, or —to 2.4m (8ft) above top of tank <sup>3</sup>	
3	Deep Tanks or Cargo Oil Tanks	Structural <sup>1,2</sup>	The greatest of  —to the top of overflow, —to 2.4m (8ft) above top of tank <sup>3</sup> , or —to the top of tank <sup>3</sup> plus setting of any pressure relief valve	
	Fuel Oil Bunkers	Structural		
4	Ballast Holds of Bulk Carriers	Structural <sup>1</sup>	The greater of —to the top of overflow, or —to 0.9m (3 ft) above top of hatch	See items 12 and 13 for hatch covers.
5a	Peak Tanks	Structural	The greater of —to the top of overflow, or —to 2.4m (8ft) above top of tank <sup>3</sup>	After peak tank test to be carried out after installation of stern tube.
5b	Fore Peak Voids (collision bhd.)	See Note <sup>4</sup>	See Note <sup>4</sup>	
5e	Aft Peak Voids	Air		
6	Cofferdams	Structural <sup>5</sup>	The greater of  —to the top of overflow, or  —to 2.4m (8ft) above top of cofferdam	
7	Watertight Bulkheads	Hose <sup>6</sup>		
8	Watertight Doors below freeboard or bulkhead deck	Hose		See 3/12.9.6 for additional test at the manufacturer.
9	Double Plate Rudder	Air		
10	Shaft Tunnel Clear of Deep Tanks	Hose		
11	Shell Doors	Hose		
12	Watertight hatchcovers of tanks on combination carriers.	Structural testing.	The greater of:  —to 2.4m (8ft) above the top of hatchcover, or  —setting pressure of the pressure relief valve.	At least every 2nd hatch cover is to be tested.
13	Weathertight Hatch Covers, Doors and other Closing Appliances	Hose <sup>6</sup>		
14	Chain Locker (abaft Collision Bulkhead)	Structural	To the top of chain locker	
15	Independent Tanks	Structural	The greater of —to the top of overflow , or —to 0.9m (3ft) above top of tank	

#### TABLE 1/2.1 (continued)

	Structures to be Tested	Type of Testing	Hydrostatic Testing Head or Pressure	Remarks
16	Ballast Ducts	Structural	Ballast pump maximum pressure or setting of any relief valve for the ballast duct if that is less.	
17	Hawse Pipes	Hose		

#### Notes

- 1. Provided the structural similarity of a group of tanks is recognized by the Bureau and a representative tank as selected by the Bureau is structurally tested based on the design approval, air testing in accordance with 1/2.1.3c may be accepted. Subsequent tanks may require hydrostatic testing if found necessary after the structural testing.
- 2. All cargo segregation boundaries in oil carriers and combination carriers and tanks for segregated cargoes of pollutants are to be hydrostatically tested.
- 3. Top of tank is the deck forming the top of the tank excluding hatchways.
- 4. Hydrostatic testing to the damaged waterline but not less than the distance to the bulkhead deck.
- 5. Air testing in accordance with 1/2.1.3c may be accepted except that hydropneumatic testing may be required in consideration of the construction techniques and welding procedures employed.
- 6. Where hose testing is impractical due to the stage of outfitting, air test or other alternate method of testing such as close visual examination and where necessary non-destructive test of all joints may be considered.

#### TABLE 1/2.2 Additional Testing Requirements for Vessels or Tanks of Special Service (1998)

	Type of Vessels or Tanks	Structures to be Tested	Type of Testing	Hydrostatic Testing Head	Remarks
1	Liquefied Gas Carriers	Ballast or Fuel Oil Tanks adjacent to or between Cargo Tank Hold Spaces	Structural	The greater of water head —to the top of overflow, or —to 2.4m (8ft) above top of tank	
2	Edible Liquid Tanks	Independent Tanks	Structural	The greater of water head —to the top of overflow, or —to 0.9m (3ft) above top of tank	
3	Chemical Carriers	Integral or Independent Tanks	Structural	The greater of water head —to 2.4m (8ft) above top of tank, or —to top of tank plus setting of any pressure relief valve	

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### Part 1 Section 3

# Surveys After Construction

#### Vessels in Salt-water Service

#### 1/3.1 Conditions for Surveys after Construction

#### 1/3.1.1 Damage, Failure and Repair

- a. Examination and Repair Damage, failure, deterioration or repair to hull, machinery or equipment, which affects or may affect classification, is to be submitted by the Owners or their representatives for examination by a Surveyor at first opportunity. All repairs found necessary by the Surveyor are to be carried out to the Surveyor's satisfaction
- b. Repairs Where repairs to hull, machinery or equipment, which affect or may affect classification, are planned in advance to be carried out, a complete repair procedure including the extent of proposed repair and the need for Surveyor's attendance is to be submitted to and agreed upon by the Bureau reasonably in advance. Failure to notify the Bureau, in advance of the repairs, may result in suspension of the vessel's classification until such time as the repair is redone or evidence submitted to satisfy the Surveyor that the repair was properly carried out.

Note: The above applies also to repairs during voyage.

The above is not intended to include maintenance and overhaul to hull, machinery and equipment in accordance with the manufacturer's recommended procedures and established marine practice and which does not require Bureau approval; however, any repair as a result of such maintenance and overhauls which affects or may affect classification is to be noted in the ship's log and submitted to the Surveyor as required by 1/3.1.1.a.

**c.** Representation Nothing contained in this section or in a rule or regulation of any government or other administration, or the issuance of any report or certificate pursuant to this section or such a rule or regulation, is to be deemed to enlarge upon the representations expressed in 1/1.1.1 through 1/1.1.4 hereof and the issuance and use of any such reports or certificates are to be governed in all respects by 1/1.1.1 through 1/1.1.4 hereof.

#### 1/3.1.3 Notification and Availability for Survey

The Surveyors are to have access to classed vessels at all reasonable times. The Owners or their representatives are to notify the Surveyors on all occasions when a vessel can be examined in dry dock or on a slipway.

The Surveyors are to undertake all surveys on classed vessels upon request, with adequate notification, of the Owners or their representatives and are to report thereon to the Committee. Should the Surveyors find occasion during any survey to recommend repairs or further examination, notification is to be given immediately to the Owners or their representatives in order that appropriate action may be taken. The Surveyors are to avail themselves of

every convenient opportunity for carrying out periodical surveys in conjunction with surveys of damages and repairs in order to avoid duplication of work. See also 1/1.11.3.

#### 1/3.1.5 Incomplete Surveys

When a survey is not completed, the Surveyor is to report immediately upon the work done in order that Owners and the Committee may be advised of the parts still to be surveyed.

#### 1/3.1.7 Alterations

No alterations which affect or may affect classification or the assignment of load lines are to be made to a classed vessel unless plans of the proposed alterations are submitted and approved by an ABS Technical Office before the work of alteration is commenced. Such work, when approved, is to be carried out to the satisfaction of the Surveyor. Nothing contained in this section or in a rule or regulation of any government or other administration, or the issuance of any report or certificate pursuant to this section or such a rule or regulation, is to be deemed to enlarge upon the representations expressed in 1/1.1.1 through 1/1.1.4 hereof and the issuance and use of any such reports or certificates are to in all respects be governed by 1/1.1.1 through 1/1.1.4 hereof.

#### 1/3.1.9 Vessels Confined to a Specific Location

For vessels confined to a specific location, such as a storage or a production vessel, the extent of the classification surveys will be specially considered.

#### 1/3.1.11 Welding and Replacement of Materials

- a. Ordinary and Higher Strength Structural Steel-
- **s** Welding or other fabrication performed on the structural steels listed in Table 2/1.1 and 2/1.2 is to be in accordance with the requirements of Section 2/3.
- **b.** Special Materials Welding or other fabrication performed on other steels of special characteristics or repairs or renewals of such steel or adjacent to such steel is to be accomplished with procedures approved for the special materials involved. The procedures are to take into account the information provided under 3/2.1 and be in accordance with requirements of Section 2/3.
- **c.** Substitutions and Alterations Substitutions of steel differing from that originally installed, alteration of original structural configuration, or change from riveted to welded joint is not to be made without approval by an ABS Technical Office.

#### 1/3.3 Survey Conditions

# 1/3.3.1 Hull Survey of Oil Tankers; Bulk Carriers and Combination Carriers; and Chemical Tankers

Oil tankers are to comply with the requirements in Appendix 1/B of these Rules. Bulk carriers including ore carriers

are to comply with the requirements in Appendix 1/C of these Rules. Combination carriers (ore/bulk/oil, ore/oil, etc.) are to comply with the applicable requirements in both Appendices. Chemical Tankers are to comply with the requirements in Appendix 1/D of these Rules.

The requirements in the above Appendix are in addition to those applicable requirements in this section.

Vessels subject to the above enhanced survey program requirements will be identified in the Record by the notation ESP.

#### 1/3.3.3 Corrosion Prevention System

- a. Corrosion Prevention System is normally to be a full hard coating which may or may not be supplemented by anodes. Other coating systems may be considered acceptable as alternatives provided that they are applied in compliance with the manufacturer's specification and properly maintained.
- **b. Coating Condition** of hard coatings is defined as follows:
  - **GOOD** is a condition with only minor spot rusting **FAIR** is a condition with local breakdown at edges of stiffeners and weld connections and/or light rusting over 20% or more of areas under consideration, but less than as defined for POOR condition.
  - **POOR** is a condition with general breakdown of coating over 20%, or hard scale at 10% or more of areas under consideration.
- c. In salt water ballast spaces, other than double bottom tanks, where poor coating condition is found and Owners or their representatives elect not to restore the coating, where a soft coating has been applied, or a protective coating has not been applied, the ballast tanks are to be internally examined at each subsequent Annual Survey. Double bottom tanks for the purpose of this requirement are those double bottom tanks separate from topside tanks, side tanks, or deep tanks.

#### 1/3.3.5 Requirements for Internal Examinations

The following apply to all internal examinations of any spaces adjacent to shell plating such as tanks, holds, voids or machinery spaces etc. and are applicable at Annual, Intermediate or Special Survey.

- a. Precautions are to be taken to ensure safety during inspection. Tanks are to be made safe for entry and work.
- b. In preparation for survey and to allow for a meaningful examination, all spaces are to be cleaned including removal from surfaces of all loose accumulated corrosion scale. Spaces are to be sufficiently clean to reveal corrosion, deformation, fractures, damages, or other structural deterioration.
- c. Where soft coatings are found, safe access is to be provided for the Surveyor to determine the effectiveness of the coatings and to carry out an assessment of the conditions of internal structures, which may include spot removal of the coating. Should the soft coating be found no longer effective, the space shall be treated as an uncoated tank and sufficient cleaning as required by 1/3.3.5.b shall be carried out prior to survey.

- d. Based on conditions found, thickness gaugings and means of access to upper part of the tank or space may be required. Where extensive areas of wastage or structural damage is found, the extent of the overall examination may be expanded to other spaces.
- **e.** Casings, ceilings or linings, and loose insulation where fitted are to be removed as required by the Surveyor for examination of plating and framing.
- f. Compositions on plating are to be examined and sounded, but need not be disturbed if found adhering satisfactorily to the plating.

#### 1/3.3.7 Lay-up and Reactivation

- a. The Bureau is to be notified by the Owner that a vessel has been laid-up. This status will be noted in the Record, and surveys falling due during lay-up will then be held in abeyance until the vessel reactivates. Lay-up procedures and arrangements for maintenance of conditions during lay-up may be submitted to the Bureau for review and confirmation by survey.
- b. In the case of vessels which have been laid up for an extended period (i.e., six months or more) the requirements for surveys on reactivation are to be specially considered in each case, with due regard being given to the status of surveys at the time of the commencement of the lay-up period, the length of the period and the conditions under which the vessel had been maintained during that period.
- c. Where the lay-up preparations and procedures have been submitted to the Bureau for review and confirmed by Annual Lay-up Surveys, consideration may be given to deducting part or all of the time in layup from the progression of survey intervals.
- **d.** For vessels returning to active service regardless of whether the Bureau has been informed previously that the vessel has been in lay-up, a Reactivation Survey is required.

#### 1/3.5 Survey Intervals

#### 1/3.5.1 Annual Classification Surveys

Annual Class Surveys of hull, machinery, automation and cargo refrigeration are to be made within three months before or after each annual anniversary date of the crediting of the previous Special Periodical Survey or original construction date. For vessels on Continuous Survey, all Continuous Survey requirements for those parts (items) due are generally to be completed each year. The Annual Survey will not be credited and the Certificate of Classification will not be endorsed unless Continuous Survey items which are due or overdue at the time of the Annual Survey are either completed or granted an extension.

Special Annual Survey—When "Annual Survey" is part of a vessel's Hull Classification notation, all the requirements of Special Periodical Survey of Hull, except for tank testing, are required each year for the first four years of each five-year cycle. At the fifth year, a complete Special Periodical Survey of Hull, including tank testing is required.

LASH Barges—For steel barges carried aboard ship, and without Load Line Certificate, an Annual Survey will not be required provided that in addition to the regular Special Periodical Survey at five (5) year intervals, a Special

Intermediate Survey, equivalent to a Special Periodical Survey, is carried out about midway between Special Periodical Surveys.

#### 1/3.5.3 Intermediate Surveys

Intermediate Surveys are to be carried out either at or between the second and third Annual Surveys.

#### 1/3.5.5 Special Periodical Surveys

- **a.** *Interval* A Special Periodical Survey is to be completed within five years after the date of build or after the crediting date of the previous Special Periodical Survey. The fifth Annual Survey must be credited as a requirement of the Special Periodical Survey. The interval between Special Periodical Surveys may be reduced by the Committee
- **b.** Commencement (1998) Special Periodical Survey may be commenced at the fourth Annual Survey and be continued with completion by the fifth anniversary date. Where the Special Periodical Survey is commenced prematurely, the entire survey is normally to be completed within 15 months if such work is to be credited to the Special Periodical Survey. As part of the preparation for the Special Survey, required thickness measurements are to be commenced as far as possible during the fourth Annual Survey.
- c. Credited Date A Special Periodical Survey will be credited as of the completion date of the survey but not later than five years from date of build or from the date recorded for the previous Special Periodical Survey. If the Special Periodical Survey is completed within three months prior to the due date, the Special Periodical Survey will be credited to agree with the effective due date.
- **d.** *Unusual Cases* Special consideration may be given to Special Periodical Survey requirements in the case of vessels of unusual design, in lay-up or in unusual circumstances. Consideration may be given for extensions of Rule-required Special Periodical Surveys under extreme circumstances.

#### 1/3.5.7 Continuous Surveys

a. (1998) At request of the Owner, and upon approval of the proposed arrangements, a system of Continuous Surveys may be undertaken, except for hull surveys of oil tankers, bulk carriers and combination carriers (such as ore/oil, etc.) and chemical tankers, whereby the Special Periodical Survey requirements are carried out in regular rotation to complete all the requirements of the particular Special Periodical Survey within a five-year period. The proposed arrangements are to provide for survey of approximately 20% of the total number of survey items during each year of the five year period. Reasonable alternate arrangements may be considered.

Each part (item) surveyed becomes due again for survey proximately five years from the date of the survey and the due parts (items) are generally to be completed each year. The Annual Survey will not be credited and the Certificate of Classification will not be endorsed unless Continuous Survey items which are due or overdue at the time of the Annual Survey are either completed or granted an extension. For

Continuous Surveys, a suitable notation will be entered in the Record and the date of the completion of the cycle published.

The Bureau may withdraw its approval for Continuous Survey if the Surveyor's recommendations are not complied with.

- **b.** In addition to the foregoing, at a survey either at or between the second and third Annual Surveys, vessels will require the equivalent of an Intermediate Survey as indicated in 1/3.5.3.
- **c.** Out of water drydocking as required by 1/3.7.9.a may be carried out at any time during the cycle provided that all requirements of 1/3.7.7 are met and thickness measurements as required by 1/3.7.9.k are carried out when the vessel is surveyed in drydock.

#### 1/3.5.9 In-line Surveys

All items required to undergo Special Periodical Surveys, including but not limited to hull, machinery, automation, and cargo refrigeration, are to be carried out at the same time and interval in order that they are recorded with the same crediting date. In cases where damage has involved extensive repairs and examination, the survey thereon may, where approved by the Committee, be accepted as equivalent to Special Periodical Survey.

#### 1/3.5.11 Drydocking Surveys

**a.** *Interval* A Drydocking Survey is to be carried out two times in any 5-year period, with an interval not exceeding 3 years between Drydocking Surveys. See also 1/3.7.9.a.

Consideration may be given for extensions of Rule required Drydock Survey. An underwater inspection by a diver may be required for such extensions.

b. Underwater Inspection in lieu of Drydocking Survey (1998) An approved underwater inspection by diver, equivalent to a Drydocking Survey, may be considered at alternate Drydocking Surveys. This alternative will not be available for Drydocking Surveys concurrent with the Special Survey-Hull referred to in 1/3.7.9.a. Vessels 15 years of age or over will be subject to special consideration based on vessel's survey status before being permitted to have such inspections. For vessels on Continuous Hull Survey, refer to 1/3.5.7.c.

#### 1/3.5.13 Tailshaft Surveys

The tail shaft survey intervals is to be in accordance with Table 1/3.4 and its associated notes. Consideration may be given for extensions of Rule required Tailshaft Surveys.

#### 1/3.5.15 Tube Shaft Surveys

Tube shafts, if fitted, are to be examined at the same interval as tail shafts.

#### 1/3.5.17 Boiler Surveys

#### a. Water-tube Boilers for Propulsion

 (1998) For vessels fitted with more than one boiler, surveys are to be carried out two times in any 5year period, with an interval not exceeding 3 years between Boiler surveys. Consideration may be given for extensions of Rule required Boiler Surveys. The

- extension may be granted by the Surveyor after a satisfactory external examination of the boiler and review of boiler operating and feedwater records.
- 2. For vessels fitted with one boiler, the interval between surveys is not to exceed 2 1/2 years for the first 7 1/2 years. Thereafter the boiler is to be surveyed annually. Consideration may be given for extensions of Rule required Boiler Surveys. The extension may be granted by the Surveyor after a satisfactory external examination of the boiler and review of boiler operating and feedwater records, provided such an extension does not exceed (6) months, and provided the boiler is surveyed twice in every 5 year period for the first 7 1/2 years.
- **b.** Fire-tube Boilers for Propulsion Boilers are to be surveyed when four years old and when six years old; thereafter boilers are to be surveyed annually.
- **c.** Auxiliary Boiler (1998) Waste-heat or fired auxiliary boilers intended for working pressures above 3.4 bar (3.5 kgf/cm 50 psi), are to be surveyed two times in any 5-year period, with an interval not exceeding 3 years between Boiler surveys. Consideration may be given for extensions of Rule required Boiler Surveys. The extension may be granted by the Surveyor after a satisfactory external examination of the boiler and review of boiler operating and feedwater records.

#### 1/3.7 Hull Surveys—Parts to be Examined

#### 1/3.7.1 Annual Surveys—Hull

At each Annual Survey the hull is to be generally examined so far as can be seen and placed in satisfactory condition. The survey is also to include the following:

#### a. Protection of Cargo Hatch Openings

- 1. (1998) Confirmation that no unapproved changes have been made to the hatch covers, hatch coamings and their securing and sealing devices since the last survey. Exposed hatch covers are to be examined to confirm the structural integrity and capability of maintaining weathertightness. Where extensive areas of wastage of steel hatch covers are found, thickness measurements are to be carried out, and renewals or repairs made when wastage exceeds allowable margins.
- 2. Where mechanically operated steel covers are fitted, examination of:
  - a. hatch covers including plating and stiffeners;
  - b. tightness devices of longitudinal, transverse and intermediate cross junctions (gaskets, gasket lips, compression bars, drainage channels);
  - c. clamping devices, retaining bars, cleating;
  - d. chain or rope pulleys;
  - e. guides;
  - f. guide rails and track wheels;
  - g. stoppers and similar devices;
  - h. wires, chains, gypsies, tensioning devices;
  - hydraulic system essential to closing and securing;
  - j. safety locks and retaining devices;
  - k. loading pads/bars and the side plate edge;
  - l. guide plates and chocks;
  - m. compression bars, drainage channels and drain pipes (if any).
- 3. Where wooden covers on portable beams or steel pontoon covers are fitted, examination of:

- a. wooden covers and portable beams, carriers or sockets for the portable beam, and their securing devices;
- b. steel pontoons;
- c. tarpaulins;
- d. cleats, battens and wedges;
- e. hatch securing bars and their securing devices.
- 4. Examination of hatch coaming plating including deck connection, stiffeners, stays, pads, chocks, and brackets. Where extensive areas of wastage are found, thickness measurements are to be carried out, and renewals or repairs made when wastage exceeds allowable margins.
- Confirmation of the satisfactory operation of all mechanically operated hatch covers is to be made, including:
  - a. stowage and securing in open condition;
  - b. proper fit and efficiency of sealing in closed condition:
  - c. operational testing of hydraulic and power components, wires, chains, and link drives.
- 6. Where the omission of gaskets has been approved in accordance with 3/18.10.1, the satisfactory condition of specially approved details such as labyrinths is to be confirmed in addition to 1/3.7.1.a.2.

#### b. Protection of Other Openings

- 1. Hatchways, manholes, and scuttles in freeboard and superstructure decks.
- Machinery casings, fiddley covers, funnel annular spaces, skylights, companionways and deckhouses protecting openings in freeboard or enclosed superstructure decks.
- 3. Portlights together with deadcovers, cargo ports, bow or stern access, chutes and similar openings in vessel's sides or ends below the freeboard deck or in way of enclosed superstructures.
- Ventilators, air pipes together with flame screens, scuppers and discharges serving spaces on or below the freeboard deck.
- 5. Watertight bulkheads, bulkhead penetrations, end bulkheads of enclosed superstructures, and the operation of any doors in same.
- Weathertight doors and closing appliances for all
  of the above including stiffening, dogs, hinges and
  gaskets. Proper operation of weathertight doors and
  closing appliances to be confirmed.
- c. Freeing ports, together with bars, shutters and hinges.
- **d.** Protection of the crew: guard rails, lifelines, gangways, and deck houses accommodating crew.
- e. Confirmation of loading guidance and stability data as applicable. Loading instruments accepted for classification are to be confirmed in working order by use of the approved check conditions. The user's instruction manual for the loading instrument is to be confirmed on board.
- **f.** Confirmation that no alterations have been made to the hull or superstructures which would affect the calculation determining the position of the load lines.
- g. Anchors and chain cables. See 1/3.9.1.d. for anchor windlass.
- **h.** Confirmation that no significant changes have been made to the arrangement of structural fire protec-

- tion; and confirmation of the operation of manual and/or automatic fire doors, if fitted.  $\,$
- i. Suspect areas and salt-water ballast spaces (1998)
- 1. Structural areas of the hull particularly susceptible to corrosion. Where extensive areas of wastage are found, thickness measurements are to be carried out and renewals and/or repairs made when wastage exceeds allowable margins.
- 2. In addition, where required by 1/3.7.5.a.1 or 1/3.7.9.f.2, internal examination of applicable salt-water ballast spaces. Where extensive areas of wastage are found, thickness measurements are to be carried out and renewals and/or repairs made when wastage exceeds allowable margins.
- j. For tankers the Annual Survey should also include the following.
- Cargo tank openings including gaskets, covers and coamings.
- Pressure/vacuum relief valves, flame arrestors, and flame screens. Tank vent protective devices are to be examined externally for proper assembly and installation, damage, deterioration or traces of carryover at the outlet. Where deemed suspect, the tank protective device is to be opened out for examination.
- 3. Cargo, crude oil washing, bunker, ballast, and tank vent piping systems above the weather deck and in the cargo pump room.

Note Where suspect, piping may require to be pressure tested at the working pressure.

- 4. Electrical bonding arrangements on weather deck and in cargo pump rooms, including bonding straps where fitted, of cargo piping systems carrying flammable liquids and piping systems routed through hazardous areas.
- 5. Confirmation that electrical equipment in hazardous locations including cargo pump room, have been properly maintained, including the following items. The list required by 4/5B1.5 may be referred to during the confirmation.
  - a. intrinsically safe and explosion-proof features of electrical equipment installed in the hazardous areas, in particular any associated sealing arrangement;
  - b. the physical condition of cables (wiring) and fixtures and test of insulation resistance of the circuits. In cases where proper record of testing is maintained consideration may be given to accepting recent readings.
  - the cable supports and the means of cable protection from mechanical damage, as originally provided
  - d. gas detection system in cargo pump room, if fitted.
  - e. temperature-sensing devices fitted on bulkhead shaft glands, pump bearings and casings, if fitted.
- 6. Pump room bulkheads including bulkhead seals.
- Confirmation that there are no potential sources of ignition in or near the cargo pump room and cargo area and that pump room access ladders are in good condition.
- Cargo and stripping pumps including foundations, gland seals, operation of remote control and shutdown devices.

- 9. Operation of pump room bilge pumping system.
- Pump room ventilation system including ducting, dampers and screens.
- 11. Confirmation that cargo discharge pressure gauges and level indicator systems are operational.
- **k.** For liquefied gas carriers refer also to 1/3.23.1 and for chemical carriers see 1/3.22.1
- Where areas of the vessel are designated for helicopter operations, the helicopter deck, securing arrangements where fitted and safety netting or equivalent are to be examined.
- **m.** For passenger vessels the Annual Survey is also to include the following:
- 1. All shell connections below bulkhead deck.
- 2. Gangways, cargo ports, and chutes below the bulkhead deck.
- 3. Portlights including deadlights and securing arrangements below the bulkhead deck.
- 4. All openings and their closures in watertight bulkheads below the bulkhead deck including watertight doors and operation of same.

#### 1/3.7.3 Special Load Lines

Where vessels have timber, tanker or special load lines, the structural arrangements, fitting and appliances upon which such load lines are conditional, are to be examined and placed in satisfactory condition.

#### 1/3.7.5 Intermediate Survey

# 1/3.7.5.a Salt Water Ballast Spaces, Vessels without ESP Notation

The following items are to be examined and placed in satisfactory condition.

- 1. For vessels over 5 years of age an overall survey of a minimum of 3 representative salt water ballast spaces selected by the Surveyor is to be carried out. Where poor coating condition is found, where soft coating has been applied, or where a protective coating has not been applied, the examination is to be extended to other ballast spaces of the same type. For vessels more than 10 years of age, all ballast tanks are to be examined.
- 2. If such examinations reveal no visible structural defects, the examination may be limited to a determination that the protective coating remains effective.
- 3. In salt water ballast spaces, other than double bottom tanks, where poor coating condition is found and owners or their representatives elect not to restore the coating, where a soft coating has been applied, or a protective coating has not been applied, the ballast tanks are to be internally examined at each subsequent Annual Survey.
- 4. (1998) When such coating conditions are found in double bottom salt water ballast tanks, internal examination at each subsequent Annual Survey may be required.

#### 1/3.7.5.b Tankers

1. For tankers with ESP notation, refer to Appendix 1/B of these Rules.

- 2. For tankers without ESP notation, in addition to items of 1/3.7.5.a, at each Intermediate Survey after Special Periodical Survey—Hull No. 2, at least three cargo tanks: one center, one port wing, and one starboard wing, are to be examined internally.
- **3.** For chemical tankers with ESP notation, refer to Appendix 1/D of these Rules.

#### 1/3.7.5.c Dry Cargo Vessels

- For bulk carriers with ESP notation, refer to Appendix 1/C of these Rules.
- 2. For dry cargo vessels without ESP notation, in addition to items of 1/3.7.5.a, at each Intermediate Survey after Special Survey—Hull No 3, at least two of the cargo holds are to be examined internally.

#### 1/3.7.5.d Combination Carriers

For combination carriers with ESP Notation, refer to applicable requirements in both Appendix 1/B and Appendix 1/C of these Rules.

#### 1/3.7.7 Drydocking Surveys

The following items are to be examined and placed in satisfactory condition.

(1998) The keel, stem, stern frame, rudder, propeller, and outside of side and bottom plating are to be cleaned as necessary and examined together with bilge keels, thrusters, exposed parts of the stern bearing and seal assembly, sea chests, rudder pintles and gudgeons together with their respective securing arrangements. All sea connections and overboard discharge valves and cocks, including their attachments to the hull or sea chests, are to be externally examined. All non-metallic expansion pieces in the seawater cooling and circulating systems are to be externally examined. Non-metallic expansion pieces in the main seawater circulating systems are to be examined both externally and internally when vessel is examined on drydock. The stern bearing clearance or weardown and rudder bearing clearances are to be ascertained and reported on. Please refer also to 1/3.9.5.a for Special Survey underwater items.

#### 1/3.7.9 Special Periodical Survey—Hull

Special Periodical Survey Hull is to include sufficient examination, tests and checks carried out by the Surveyors to satisfy themselves that the hull, equipment and related piping are in or placed in satisfactory condition and are fit for its intended purpose for the next five year period subject to proper maintenance and operation and to periodic surveys being carried out at the due dates. Special Periodical Survey is to include the following:

- **a.** The vessel is to be placed in a drydock or upon a slipway and all items of 1/3.7.7 are to be examined.
- **b.** The rudder is to be examined and when required, lifted and the gudgeons rebushed. The condition of carrier and steadiment bearings and the effectiveness of stuffing boxes are to be ascertained when the rudder is lifted.
- c. The anchors and chain cables are to be ranged, examined and the required complement and condition confirmed. The chain locker, holdfasts, hawse pipes and chain stoppers are to be examined and pumping arrangements of the chain locker operationally tested.

At Special Survey No. 2 and subsequent surveys, chain cables are to be gauged and renewed in cases where their mean diameter is 12% or more below the original required nominal size. Where structural alterations to the vessel have resulted in a higher equipment numeral, the original chain cables may be used until their mean diameter has been reduced to 12% below the nominal diameter of the larger cable required by the higher equipment numeral.

- **d.** All openings in the shell including overboard discharges and ash chutes are to be examined.
- e. All decks, watertight bulkheads, and internal and external surfaces of shell plating are to be examined. Plating in way of sideshell or superstructure portlights is to be especially examined.

#### **f.** Spaces

- 1. All spaces including holds and their 'tween decks where fitted; double bottom, deep, ballast, peak and cargo tanks; pumprooms, pipe tunnels, duct keels, machinery spaces, dry spaces, cofferdams and voids are to be internally examined including the plating and framing, bilges and drain wells, sounding, venting, pumping and drainage arrangements. Where sounding pipes are fitted, the Surveyor is to confirm that a thick steel plate is securely fixed below the sounding pipe for the rod to strike upon. Electrical bonding arrangements, including bonding straps where fitted, for the piping systems located within cargo tanks, pipe tunnels, cofferdams and void spaces bounding cargo tanks are also to be examined.
- 2. In salt water ballast spaces, other than double bottom tanks, where poor coating condition is found and owners or their representatives elect not to restore the coating, where soft coating has been applied, or where a protective coating has not been applied, the ballast tanks are to be internally examined at each subsequent Annual Survey.
- 3. (1998) When such coating conditions are found in double bottom salt water ballast tanks, internal examinations at each subsequent Annual Survey may be required.

#### g. Tank protective devices

- 1. All tank protective devices, where fitted, are to be examined externally for proper assembly and installation, damage, deterioration, or traces of carryover at the outlets. Where deemed suspect, the tank protective device is to be opened out for examination to confirm condition.
- 2. All pressure-vacuum values and pressure relief valves are to be opened out, pressure and vacuum value discs checked for good contact with their respective seats and/or proved by testing.
- **h.** Internal examination requirements will be specially considered for lube oil tanks and for tanks used exclusively for permanent ballast which are fitted with an effective means of corrosion control.
- i. Where double bottom and other tanks, except for the peak tanks, are used primarily for heavy fuel oil or exclusively for light oils, the internal examination may be waived provided that upon a general external examination of the tanks, the Surveyor finds their condition to be satisfactory.

In addition to the general external examination, the following internal examinations are to be carried out and found

satisfactory as a condition of waiving the internal examination of the remaining fuel oil tanks.

at Special Survey No. 3—one forward fuel oil double bottom

at Special Surveys Nos. 4 and 5—one fuel oil double bottom forward, one in vicinity of amidships, and one aft at Special Survey No. 6 and subsequent - one fuel oil double bottom in way of each cargo hold

- j. Independent oil tanks in machinery spaces are to be externally examined and, if deemed necessary, tested under a head of liquid.
- k. Thickness gaugings are to be carried out in accordance with Tables 1/3.2, and 1/3.3. Where extensive areas of wastage are found, thickness measurements are to be carried out, and renewals or repairs made when wastage exceeds allowable margins. Where reduced scantlings on the basis of effective corrosion control are adopted as permitted by 3/2.3.2 of the Rules, RECORD Special Comment No 11, the results of any gaugings are to be evaluated based on the scantlings before reduction.

For thickness gauging requirements for tankers; bulk carriers and combination carriers; and chemical tankers with ESP notation, refer to Appendix 1/B, 1/C and 1/D of these Rules, respectively.

1. Boundaries of double-bottom, deep, ballast, peak, and other tanks are to be tested with a head of liquid. The testing of double bottoms and other spaces not designed for the carriage of liquid may be omitted provided a satisfactory internal examination together with an examination of the tanktop is carried out. Tank testing requirements within the cargo section are modified by the following:

For Oil Tankers with ESP Notation, see 1/B.2.6, Appendix 1/B.

For Bulk Carriers with ESP Notation, see 1/C.2.7, Appendix 1/C.

For Chemical Tankers with ESP notation, see 1/D.2.6, Appendix 1/D.

For independent cargo tanks, see 1/3.7.9.o.

For vessels intended to carry liquefied gas, see 1/3.23.3.

- **m.** (1998) The hatch covers and coamings are to be surveyed as follows:
- 1. A thorough examination of the items listed 1/3.7.1.a is to be carried out.
- 2. Confirmation of the effectiveness of sealing arrangements of all hatch covers by hose testing or equivalent. Where the omission of gaskets has been approved in accordance with 3/18.10.1, hose tests are not required provided the surveys required by 1/3.7.1.a.6 are satisfactorily carried out.
- 3. Where extensive area of wastage of steel hatch covers, coamings or their stiffeners are found, thickness measurements are to be carried out and renewals made when wastage exceeds allowable margins.
- Load Line marks are to be checked and recut and/ or painted as required.
- o. The following requirements 1 through 9, apply only to independent cargo tanks (i.e., separated from the main hull structure) except those on liquefied gas carriers (see 1/3.23).

- 1. Independent Cargo Tanks An internal examination is to be made of all independent cargo tanks including internal mountings and equipment. The tanks are to be thoroughly cleaned and cleared of gas before entry, and every precaution is to be taken to insure safety during examination.
- 2. Independent Cargo Tank Supports and Hull Structure Fittings Foundations, chocks, sway braces, keys, and anti-flotation arrangement are to examined.
- 3. Independent Cargo Tank Venting Systems and Liquid-level Indicators Venting systems for the cargo containment systems are to examined. All relief valves are to be opened, examined, tested, and readjusted as necessary. Liquid-level indicators are to be proven in order. Where a proper record of continuous overhaul and retesting of individually identifiable relief valves is maintained, consideration will be given to acceptance on the basis of opening, internal examination, and testing of a representative sampling of valves including each size of each type of relief valve in use, provided there is logbook evidence that the remaining valves have been overhauled and tested since the crediting of the previous Special Survey. The testing and setting of relief valves may be carried out in place or after removal.
- 4. Cargo Handling Systems All piping, machinery, and equipment for loading, venting, compressing, refrigerating, liquefying, heating, or otherwise handling the cargo are to be generally examined. All quick-closing and emergency shut-off valves in the cargo piping systems are to be examined and tested.
- 5. Insulation Removals Insulation is to be removed in way of any distorted or otherwise suspect part in the cargo containment system and elsewhere as required by the Surveyor. Insulation may be required to be removed to carry out any of the previous items at the discretion of the Surveyor.
- 6. *Thickness Gauging* Where there is evidence of corrosion, the plating or structure of the independent tank is to be gauged by nondestructive means to determine the thickness.
- 7. Tightness Tests Tanks, other than independent pressure tanks, are to be tested with a head of liquid to the overflow or by an alternative method meeting the approval of the attending Surveyor. In certain designs water should not be used as the test liquid as it may overstress or contaminate the tank.
- 8. Independent Pressurized Cargo Tanks Independent pressure tanks, complying with the requirements of Section 4/2, are to be hydrostatically, hydropneumatically, or otherwise pressure tested at each Special Survey. This requirement may be modified at alternate Special Surveys if the internal and external survey of such pressure vessels indicates no evidence of leakage, distortion, or wastage. The test pressure is to be 1.25 times the maximum allowable relief valve setting (MARVS) which corresponds to the maximum allowable working pressure of the independent tank.
- 9. At the Special Survey Hull No. 3, the plating of all independent cargo tanks (shell, heads, and domes) is to be gauged by nondestructive means to determine the thickness. At subsequent Special Periodical Surveys special consideration will be given to modi-

- fying this requirement upon prior application from owners.
- p. For additional Special Periodical Survey requirements, refer to the following sections:

For Oil Tankers with ESP Notation, see Appendix 1/B.

For Bulk Carriers with ESP Notation see Appendix 1/C

For Chemical Tankers with ESP Notation see Appendix 1/D.

For vessels intended to carry chemicals in bulk, see 1/3.22.3.

For vessels intended to carry liquefied gas, see 1/3.23.3.

#### 1/3.9 Machinery Surveys—Parts to be Examined

#### 1/3.9.1 Annual Surveys—Machinery

At each Annual Survey the machinery and electrical installation are to be generally examined so far as can be seen and placed in satisfactory condition. The survey is also to include:

- a. (1998) Machinery and boiler spaces with particular attention to the propulsion system, auxiliary machinery, including all main and auxiliary piping systems where accessible, and confirmation that emergency escape routes are not blocked.
- **b.** Main propulsion gear-tooth contact is to be examined at the time of the first Annual Survey after vessel enters service, or after replacement gears have been placed in service. Examination for conventional gear units 1120 kW (1520 mhp, 1500 hp) and below and for all epicyclic gear units will be subject to special consideration. See 4/3.39.
- c. All accessible parts of the steering arrangements together with an operational test of the main and auxiliary steering gear, including their associated equipment and control systems, performed while the vessel is not underway.
- d. Anchor windlass
- e. Testing of all means of communication between the navigating bridge, the machinery control positions, and the steering gear space, as well as the alternative steering position, if fitted.
- **f.** Bilge pumping system and bilge wells including operation of pumps, remote reach rods and level alarms, where fitted. For passenger vessels, operational test to include emergency bilge system.
- g. Boilers, pressure vessels, and their external mountings, including safety devices, foundations, control, relieving gear, high-pressure and steam escape piping, insulation and gauges.
- h. Electrical machinery, the emergency sources of electrical power, the switchgear, and other electrical equipment including operation of same. Confirmation, as far as practicable, of the operation of the emergency sources of electrical power and, where appropriate, their automatic operation.
- i. Fire-extinguishing apparatus required for Classification as outlined in Section 4/9 including examination and/or test of the following:
- 1. Fire main system including isolating valves and hydrants. Fire mains are to undergo satisfactory pressure testing at the working pressure;

- 2. Fire pumps including demonstration that each fire pump including the emergency fire pump can deliver two jets of water simultaneously from different hydrants;
- 3. Confirmation that fire hoses, nozzles, applicators and spanners are in good working condition and situated at their respective locations;
- Confirmation that all semi-portable and portable fire extinguishers are in their stowed positions, checking for evidence of proper maintenance and servicing, conducting random check for evidence of discharge containers;
- Examination of fixed fire-fighting system controls, piping, instructions and marking, checking for evidence of proper maintenance and servicing, including date of last systems tests;
- 6. Examination as far as possible and testing as feasible of the fire and/or smoke detection system(s);
- 7. Confirmation, as far as practicable, that the remote controls for stopping fans and machinery and shutting off fuel supplies in machinery spaces are in working order;
- 8. Confirmation that the fireman's outfits are complete and in good condition;
- For tankers, an external examination of piping and cutout valves of cargo tank and cargo pumproom fixed fire-fighting system.
- 10. For tankers, confirmation that the deck foam system is in operating condition.
- 11. The effectiveness of the preventative maintenance program was satisfactory.

Note: (1998) These requirements for fire-extinguishing apparatus are intended as minimum classification requirements and do not prevent more extensive requirements by the Flag Administration. Where the examinations and/or tests required are carried out by the Bureau on behalf of an Administration, or by a Flag Administration, their acceptance will be subject to a satisfactory general examination of the fire fighting equipment and a review of the relevant documentation.

- j. For liquefied gas carriers, see 1/3.23.1 and for chemical carriers, see 1/3.22.1.
- **k.** For vessels with inert gas systems, see 1/3.24.1.
- **l.** Where areas of the vessel are designated for helicopter operations the following, where fitted, are to be examined.
- Access arrangements, ventilation and electrical equipment.
- 2. Fuel storage and refueling system including tank, pumps, piping, valves, vent, sounding, overflow, spill containment, and remote shutdowns.

#### 1/3.9.5 Special Periodical Surveys-Machinery

At each Special Periodical Survey the following items are to be examined and placed in satisfactory condition.

- **a.** All openings to the sea, including sanitary and other overboard discharges together with the valves connected therewith, are to be examined internally and externally while the vessel is in dry dock and the fastenings to the shell plating are to be renewed when deemed necessary by the Surveyor.
- **b.** Pumps and pumping arrangements, including valves, pipes, and strainers, are to be examined. The Surveyor is to be satisfied with the operation of the

- bilge system, including an internal examination of the emergency bilge suction valve. Other systems are to be tested as considered necessary.
- **c.** Shafts (except the tail shaft), thrust bearings, and lineshaft bearings are to be opened for examination.
- d. The foundations of main and auxiliary machinery are to be examined.
- e. Heat exchangers and other unfired pressure vessels with design pressures over 6.9 bar (7 kgf/cm², 100 psi) are to be examined, opened out and pressure tested as deemed necessary, and associated relief valves proven operable. Evaporators that operate with a vacuum on the shell need not be opened, but may be accepted on basis of satisfactory external examination and operational test or review of operating records.
- **f.** Examination of the steering machinery is to be carried out, including an operational test and checking of relief-valve settings. Further, a hydrostatic check of the steering system to the relief valve setting is to be conducted using the installed power units. The machinery may be required to be opened for further examination as deemed necessary by the Surveyor.
- g. Reduction gearing is to be opened and examined as deemed necessary by the Surveyor in order to confirm the condition of the gears, pinions, shafts, bearings and lubrication system. Alternative means of ascertaining the condition of epicyclic gearing will be specially considered.
- h. On tank vessels, and fuel oil carriers, an examination is to be made of cargo handling systems including cargo pumps and drives, cargo piping, vent piping, valves and equipment. All remotely operated valves in the cargo piping system are to be examined and tested. For independent cargo tanks, see 1/3.7.9.o. For inert gas systems, see 1/3.24.
- Examination of anchor windlass including operational check, check of the brake, and testing of safety devices.
- **j.** Steam reciprocating engines are to be opened and examined including cylinders, pistons, valves, valve gear, crossheads, crankpins, main journals, and thrust bearing.
- **k.** Main and auxiliary steam condensers are to be opened, examined, and leak tested as deemed necessary by the Surveyor.
- 1. Main steam piping is to be examined and where deemed necessary by the Surveyor, sections may be required to be removed for examination. Where deemed necessary by the Surveyor, the thickness is to be ascertained by non-destructive means. Alternatively, for installation operating at temperatures not exceeding 427C (800F) hydrostatic tests to 1.25 times the working pressure may be accepted. Copper pipes are to be annealed before the test. Where deemed necessary by the Surveyor, the thickness is to be ascertained to determine the future working pressure.
- **m.** Cycloidal propellers are to examined, function tested, checked for leakage and opened as deemed necessary.
- **n.** For liquefied gas carriers, see 1/3.23.3 and for chemical carriers, see 1/3.22.3

#### 1/3.9.5.a Electrical Equipment

The entire electrical installation including the following items are to be examined and placed in satisfactory condition.

#### a. Auxiliary Apparatus

- 1. Fittings and connections on main switchboards and distribution panels are to be examined, and care is to be taken to see that no circuits are overfused.
- 2. Cables are to be examined as far as practicable without undue disturbance of fixtures.
- 3. All generators including emergency generator are to be run under load. Where the generators are arranged to operate in parallel, satisfactory load sharing and operation of the circuit breakers, including the reverse power trip, is to be demonstrated.
- 4. All equipment and circuits are to be examined for possible development of physical changes or deterioration. The insulation resistance of the circuits is to be measured between conductors and between conductors and earth and these values compared with those previously measured. Any large and abrupt decrease in insulation resistance is to be further investigated and corrected.
- 5. Where electrical auxiliaries are used for vital purposes, the generators and motors are to be examined and their prime movers opened for examination. The insulation resistance of each generator and motor is to be measured with all circuits of different voltages above earth being tested separately. This test is to be made with direct current potential to earth as follows:

500 volts DC for units 550 volts AC (phase to phase) or lower and also for DC fields

1000 volts DC for units 551 volts AC (phase to phase) up to 4000 volts AC.

2500 volts DC for units 4001 volts AC (phase to phase) and up.

The direct current potential is to be applied for at least 30 seconds and the minimum insulation resistance is to be of the order of one-half to one megohm.

#### b. Main Propulsion Apparatus

- 1. The windings of generators and motors are to be thoroughly examined and found or made dry and clean. Particular attention is to be paid to the ends of all windings of stators and rotors.
- 2. All air ducts in stator coils and the ventilating holes in rotors and retaining rings of alternators are to be carefully examined and found or made clear and clean.
- 3. All cable runs are to be examined and found or placed in good condition as to supports, etc., and the ground connections of protective coverings or sheath found substantial and effective. Particular attention is also to be paid to high-potential bus insulators, which are to be free from dust or oil in order to prevent creepage to ground.
- 4. The insulation resistance of each propulsion unit is to be measured and found equal to the requirements noted above for auxiliary generators and motors. In order to further evaluate these insulation-resistance readings, it is recommended that a separate log be kept of insulation-resistance measurements taken

- frequently at regularly scheduled intervals. Humidity, ambient temperature, and condition of the machine are also to be noted. Any large and abrupt decrease in insulation resistance, when compared with those recorded in the log, is to be investigated and corrected.
- 5. Alternately, a log of insulation resistance values is to made at the beginning of the survey and insulation resistance is to be measured again at the end of the survey; a comparison is to be made between the measured value and the log made at the beginning of the survey. Any large or abrupt decrease in insulation resistance is to be further investigated and corrected.

#### c. Major Repairs

On the occasion of major repairs, the coils repaired or renewed are to be subjected to a dialectric strain test as specified under the applicable parts of 4/5C2.7. In addition the circuits containing the repairs or renewals and coils which have been disturbed during repairs are to be subjected to dielectric strain tests for one minute by application of a potential of 125% of the maximum operating voltage of the circuits to which it is applied. The DC fields of generators and motors are to be subjected for one minute to a test potential equal to 50% of the value specified under the applicable parts of 4/5C2.7, and the whole apparatus operated under full-load conditions.

#### 1/3.9.5.b Steam Turbines

Main and auxiliary turbines are to be opened and examined including nozzles, rotor with blading and shrouding, bearings, stationary blading, interstage packing, gland seals with oil barriers, bleed controls and foundation expansion arrangements. Throttle valves are to be operationally tested and opened as deemed necessary.

(1998) At Special Periodical Survey No. 1, lifting of the main propulsion turbine casing may be waived, provided the turbines are fitted with rotor position indicators and vibration indicators of an approved type, as well as steam pressure measuring equipment at appropriate locations in the steam flow path. Rotor bearings, thrust bearings and the flexible coupling are to be opened and examined. The low pressure turbine exhaust trunk is to be opened for examination of the last row of low pressure and astern wheels. Turbine operating records are to be reviewed. The arrangements for change over in case of emergency operation of the plant are to be readily available. The turbines are to be operationally tested.

(1998) Turbine casings are to be lifted at Special Survey No. 2 and subsequent Special Surveys. However, provided an approved preventative maintenance arrangement has been established, including vibration monitoring, lubricating oil analysis and rotor position checks; provided the rotor journal bearings, thrust bearings and flexible couplings are opened up for examination, the low-pressure turbine exhaust trunk is opened for examination of the last row of low pressure and astern wheels, and provided the turbine operating records are reviewed and all considered satisfactory by the Surveyor, the lifting of main propulsion turbine casings may be waived at Special Survey No. 3 and alternate, subsequent Special Periodical Surveys. The turbines are to be operationally tested.

#### 1/3.9.5.c Internal-combustion Engines

- 1. Main and auxiliary internal combustion engines are to be opened and examined including cylinders, cylinder heads, valves and valve gear, fuel pumps, scavenging pumps, and superchargers, pistons, crossheads, connecting rods, crankshafts, clutch, reversing gear, air compressors, intercoolers, and such other parts of the main and auxiliary machinery as are considered necessary. Tie rods are to be retensioned as necessary, engine entablature bolting checked for tightness, and crankshafts deflections of low-speed-type engines measured. Parts which have been examined within fifteen months need not be examined again except in special circumstances. Special consideration as to the requirements for Special Periodical Surveys may be given for main engines with bores 300 mm (11.8 in.) or under provided the engine is maintained under a manufacture's scheduled maintenance program. The records of the program, including lubrication servicing, are to be made available to the Surveyor. Periodical overhauls, required by the manufacture's scheduled maintenance program, are to be witnessed by the Surveyor and will be accepted for completion of the cycle.
- 2. Air reservoirs are to examined and their relief valves proven operable. If air reservoirs cannot be examined internally they are to be hydrostatically tested.
- Essential components of the engine fuel oil system including fuel oil service pumps, separators, and heaters are to be examined.

#### 1/3.9.5.d Gas Turbines

Gas turbines are to be opened and maintained in accordance with manufacturer's recommendations as appropriate for the actual operating conditions applicable. Owners are to submit for approval maintenance schedules for each type of gas turbine in service specifying proposed intervals for combustion checks, hot-gas-path examinations and major examinations. Upon approval, the schedules will become part of the Special Periodical Survey of Machinery records.

For units in continuous service, at least one hot-gaspath examination is to be scheduled each survey cycle and is to include an examination of turbine rotors, fixed blading, combustors, inlet casings (including demisters and filters), exhaust casing including regenerator, air control valves, and protective apparatus. Other parts and associated equipment as may be deemed necessary by the attending Surveyor, are to be opened up for examination. Opening of compressor sections is to be scheduled in conjunction with major examinations provided that examination of the blades visible from the inlet plenum during the hot-gas-path examination reveals no evidence of defects. The required examinations of auxiliary gas turbine units, at least once each cycle, are to be based on manufacturer's recommendations, as appropriate for the actual operating hours and conditions, together with an operation test including protective apparatus.

Where units are arranged such that the unit is removed from the vessel and dismantled at another facility, the internal examination may be carried out at the facility. The reinstallation is to be carried out to the satisfaction of the Surveyor.

Upon reassembly/reinstallation all fuel lines, lube oil piping, the unit itself and exhaust system are to be checked under full speed operational conditions for leakage. All shielding and fuel oil double wall piping is to be examined.

#### 1/3.9.5.e Examination During Overhaul

On all occasions of overhaul or adjustment, access is to be provided for the Surveyor to examine the parts opened. In the event of defects being discovered, such other parts as may be considered necessary are to be opened and examined.

#### 1/3.9.5.f Examination at Shorter Intervals

If it is found desirable, upon examination, that any part of the machinery should be examined at shorter intervals than specified above, it will be necessary for Owners to comply with the Committee's requirements in this respect.

#### 1/3.9.5.g Preventative Maintenance Techniques

Vessels which have an approved program of Preventative Maintenance will be given special consideration as to the details and intervals for examination of machinery.

#### 1/3.11 Tail Shaft Surveys

#### 1/3.11.1 Survey Details

- **a.** *Tapered Shafts* The survey details 1 and 2 below apply to a shafting arrangement where the propeller is taper fitted to the shaft.
  - 1. Water-Lubricated Bearings The survey is to consist of removing the propeller and drawing in and examining the entire shaft. During each survey, the shaft is to be examined by a surface crack-detection method (such as magnetic particle or dye penetrant) all around the shaft from the after edge of the liner for one-third of the length of the taper, including forward end of keyway (if fitted).
  - 2. Oil-Lubricated Bearings The survey may be carried out as described above. Alternatively, on the basis of satisfactory service record, lubricating oil analysis, bearing weardown, and the condition of the inboard and outboard seal assemblies, the survey may consist of removing the propeller to expose the forward end of the taper and performing a nondestructive examination by a surface crack-detection method (such as magnetic particle or dye penetrant) all around the shaft in way of the forward portion of the taper section, including the end of keyway (if fitted).
- **b.** Flanged Propeller Shafts The Surveys detailed below are applicable where the propeller is fitted to the shaft by means of a coupling flange.
  - 1. Water-Lubricated Bearings The Survey is to consist of withdrawing the shaft in its entirety.
  - 2. Oil-Lubricated Bearings The Survey may be carried out as described above. Alternatively, the survey may consist of the verification of a satisfactory service record, lubricating oil analysis, stern bearing weardown, shaft seal effectiveness, and for controllable pitch propellers a blade seal leak and function test.

- 3. Coupling Bolts and Flange Radius Whenever the coupling bolts of any type of flange-connected shaft are removed or the flange radius is made accessible in connection with overhaul or repairs, the coupling bolts or flange radius are to be examined by means of a surface crack detection method.
- 4. Controllable-Pitch Propellers Controllable-pitch propellers are to be surveyed along with the tailshaft. The propeller is to be function tested, examined for leaks, and opened out as deemed necessary by the attending Surveyor.

#### 1/3.11.3 Allowable Bearing Weardown

a. Water-Lubricated Bearing Other than Rubber The after bearing is to be rebushed when clearance has reached the following limits.

Shaft Diameter mm (in)	Clearance in mm (in)		
	Machinery amidships	Machinery aft	
≤ 230 (9)	6.4 (0.25)	4.8 (0.19)	
230 (9) \le 305 (12)	8.0 (0.31)	6.4 (0.25)	
> 305 (12)	9.5 (0.38)	8.0 (0.31)	

- **b.** Water-lubricated Rubber Bearing Water-lubricated rubber bearings are to be rebushed when any water groove is 50 % of the original depth, or when ever the clearance exceeds the limits as given above for water-lubricated bearings other than rubber, whichever occurs first.
- c. Oil-lubricated Bearings Oil-lubricated bearings are to be rebushed when the weardown exceeds the manufacturer's recommendations.

#### 1/3.13 Boiler Surveys

- 1. At each survey the boilers, superheaters, and economizers are to be examined internally (water-steam side) and externally (fire side).
- Boiler mountings and safety valves are to be examined at each survey and opened as considered necessary by the Surveyor.
- **3.** The proper operation of the safety valves is to be confirmed at each survey.
- **4.** When considered necessary by the Surveyor, the boilers and superheaters are to be subjected to hydrostatic pressure test.

# 1/3.19 Shipboard Automatic and Remote-control Systems

#### 1/3.19.1 Annual Survey

In order to retain the ACCU, ACC or ABCU symbol, at each Annual Survey the automatic and remote-control system is to be generally examined so far as can be seen and placed in satisfactory condition. The examination is to be made with a ship's service generator in operation and the control system energized to permit random checking of function indicators, alarms and such control actuators as may be operational. The Surveyor is to examine the

machinery records to check the performance of the control system throughout the period since the last survey and to establish if there has been any abnormal functioning or failures and what corrective measures had been taken to preclude their recurrence. The machinery fire-detecting and bilge water-level alarms are to be checked for performance.

#### 1/3.19.2 Special Periodical Surveys

In order to retain the ACCU, ACC or ABCU symbol, at each Special Periodical Survey, the following items are to be examined and placed in satisfactory condition.

- **a.** *Control Actuators* All mechanical, hydraulic and pneumatic control actuators and their power systems are to examined and tested as considered necessary.
- **b.** *Electrical* The insulation resistance of the windings of electrical control motors or actuators is to be measured, with all circuits of different voltages above ground being tested separately, and is to be on the order of one-half to one megohm.
- **c.** *Unattended Plants* Control systems for unattended machinery spaces are to be subjected to dock trials at reduced power on the propulsion engine to check the proper performance of all automatic functions, alarms and safety systems.

#### 1/3.21 Cargo Refrigeration Plant

(1998) Surveys of cargo refrigeration plant are to be carried out in accordance with the Guide for Building and Classing Vessels Intended to Carry Refrigerated Cargoes.

## 1/3.22 Vessels Intended to Carry Chemicals in Bulk

#### 1/3.22.1 Annual Surveys

The following chemical carrier features are to be examined and placed in satisfactory condition together with the conventional Annual Survey of Hull and Machinery.

- **a.** Accommodation Spaces Verify gas and vapor tightness of doors and airports.
- **b.** Cargo Pump Rooms Verify unrestricted passage from floor and ladder platforms in pump room as well as unrestricted access to cargo handling systems. Hoisting arrangements are to be examined.
- **c.** Cargo Handling Piping and Machinery All piping, cargo hoses, emergency shutdown valves, remote operating valves, machinery and equipment for loading, unloading, venting heating/cooling or otherwise handling chemicals are to be examined. Pump pressure gauges are to be examined. See also 1/3.22.1.l.
- **d.** Ventilating Systems Those systems for all spaces in the cargo area, including air locks, cargo pump rooms, cargo control rooms and spaces used for cargo handling operations are to be examined. Closing devices of all air intakes and openings into the accommodation service and control spaces are to be examined. All portable ventilating equipment required for use in the cargo area is to be examined.
- **e.** Cargo Tank Vent System The venting system including liquid-level indicators and alarms for the cargo tanks, as required, are to be confirmed in satisfactory operating condition. Vent line drainage arrangement is to be examined.

- f. Environmental Control of Vapor Space in Cargo Tanks and Void Spaces Surrounding Such Tanks Where a controlled atmosphere is required an examination of the control provided and verification that an adequate supply of the specified medium is onboard or can be produced onboard as required.
- **g.** *Pump and Pipeline Identification* Verification of pipe and pump markings.
- **h.** Vapor Detection Verify as required the means provided for detection and testing for toxic and flammable vapor concentrations including proper working conditions.
- **i.** *Personnel Protection* Firemen's outfits, protective clothing and respiratory protection equipment are to be examined. Decontamination showers and eye wash are to be examined and operationally tested as far as practicable.
- **j.** *Operating Instructions* Instructions and information material, such as cargo handling plans, loading manual and filling limit information, are to be confirmed on board the vessel.
- **k.** Fire Protection and Fire Extinguishing Equipment The fire main equipment, water spray equipment, dry chemical powder fire extinguishing systems in the cargo area, and fixed inerting and fixed smothering installations are to be examined and operationally tested in so far as practicable.
- **1.** Electrical Bonding Electrical bonding arrangements on weather deck and in cargo pump rooms, including bonding straps where fitted, of cargo piping systems carrying flammable liquids and piping systems routed through hazardous areas are to be examined. Bonding to hull, where applicable, of cargo tanks is to be examined.

#### 1/3.22.3 Special Periodical Surveys

The following chemical carrier features are to be examined and placed in satisfactory condition together with the conventional Special Periodical Surveys of Hull and Machinery.

- **a.** Cargo Pump Rooms Examine for leakage and drainage arrangements, including operational test of the bilge system.
- **b.** Cargo Transfer and Control System Examine cargo transfer system including operational test of remote shut-down devices and remote operating valves as fitted. Verify that the cargo hoses are compatible with the cargo carried, and suitable for the cargo temperature and working pressures.
- **c.** *Temperature Control* The cargo heating or cooling systems as required are to be examined including temperature indicating devices and alarm systems.
- **d.** *Electrical Equipment* Electrical equipment in hazardous locations, spaces, or zones is to be examined.
- **e.** *Bonding* The electrical bonding arrangements including bonding straps where fitted, for independent cargo tanks and for the piping systems located within cargo tanks, ballast tanks, pipe tunnels, cofferdams and void spaces bounding cargo tanks are to be examined.
- **f.** *Insulation Removals* Insulation is to be removed in way of any distorted or otherwise suspect structural part of the cargo tanks or elsewhere to carry out any of the previous examinations as required by the Surveyor.
- **g.** *Tank Testing* See Table 1/D.3 for testing of tanks referred to in 1/D.1.1.2.

**h.** *ESP Notation* For additional Special Periodical Survey requirements for chemical tankers with ESP notation, see Appendix 1/D of these Rules.

### 1/3.23 Vessels Intended to Carry Liquefied Gases

### 1/3.23.1 Annual Surveys

The following liquefied gas features are to be examined and placed in satisfactory condition together with the conventional Annual Survey of Hull and Machinery.

# a. First Annual Survey

- 1. Cargo Containment System An external examination is to be made of the cargo containment system including the supporting and positioning arrangements, hatches, access arrangements and penetrations, the secondary barrier where fitted, adjacent hull structure, and the insulation, insofar as possible without removing fixed insulation or structural members unless deemed necessary by the attending Surveyor. For membrane or semi-membrane tanks the secondary barrier of at least one tank should be checked for its effectiveness by means of a pressure/vacuum test or other approved method.
- Cargo Tanks An internal examination is to be made of liquefied gas cargo tanks other than type C, after being gas-freed, including internal mountings and equipment.
- 3. Relief Valves Representative relief valves in the cargo containment system of each size of each type are to be opened and examined internally. All relief valves are to be proven operable to the satisfaction of the Surveyor.
- Secondary Barriers The secondary barrier is to be checked for its effectiveness by means of a pressure/ vacuum test, a visual inspection, or other acceptable method.
- 5. Other Items See 1/3.23.1.b for additional items to be included in the first Annual Survey.

# b. All Annual Surveys

- 1. Interbarrier Space Venting System The venting system or other arrangements provided for the emergency removal of gas from the interbarrier spaces (i.e. between the primary and secondary barriers) is to be confirmed in satisfactory condition.
- 2. Cargo Tank Venting System and Liquid Level Indicators (1998) The venting system, for the cargo tanks and hold spaces, and liquid-level indicators and alarms for the cargo tanks are to be confirmed in satisfactory operating condition. Vent line drainage arrangement is to be examined.
- 3. Instrumentation & Safety Systems (1998) Gas leakage detection equipment, including indicators and alarms, is to be confirmed in satisfactory operating conditions. Systems for temperature and pressure indication of the cargo, cargo tank boundaries, insulation, the hull adjacent to the cargo containment system, and cargo refrigerating installations where fitted, including alarms, are to be confirmed in satisfactory operating condition. The piping of the gas detection system is to be visually examined for corrosion and damage and the integrity of the line between suction points and analyzing units is to be confirmed as far as possible.

- 4. Environmental Control of Hold Spaces (1998) Inert gas and dry air systems, including indicators and alarms, are to be confirmed in satisfactory operating condition. Means for prevention of backflow of cargo vapor into gas-safe spaces is to be confirmed in satisfactory operating condition.
- 5. Cargo Handling Piping and Machinery (1998) All piping, cargo hoses, emergency shut-down valves, remote operating valves, machinery and equipment for loading, unloading, venting, compressing, refrigerating, liquefying, heating or otherwise handling the liquefied gas or vapor is to be examined as far as possible. Stopping of the cargo pumps and compressors upon emergency shut-down of the system is to be confirmed. See also 1/3.23.1.b.18.
- 6. Cargo Tank Tightness The tightness of cargo tanks is to be confirmed. For this purpose, the vessel gas leak detectors, micro-flow meters, etc. may be utilized providing that they are first proved to be in good order. The vessel's logbooks are also to be reviewed to confirm the tightness of the cargo tanks.
- 7. Heating Coils Heating coils and other heating systems which are fitted and essential for the heating of the hull structure to ensure that the temperature of the structure does not fall below the minimum allowable value for the material used are to be proven in satisfactory operating condition.
- 8. Ventilating Systems (1998) Examination of ventilation system is to be made for all spaces in the cargo area, including air locks, cargo pump rooms, cargo compressor rooms, cargo control rooms and spaces used for cargo handling operations. All portable ventilating equipment required for use in the cargo area is to be examined. Provision of spares for cargo area mechanical ventilation fans recommended by manufacturer is to be confirmed.
- 9. Spaces in Cargo Areas (1998) Air locks, cargo pump rooms, cargo compressor rooms, rooms containing electric motors for driving cargo pumps or compressors, cargo control rooms, and spaces used for cargo handling operations are to be examined. All accessible gas-tight bulkhead penetrations including gastight shaft seals are to be examined. The means for accomplishing gas tightness of the wheelhouse doors and windows, and closing devices for all air intakes and openings in superstructures and deckhouse facing the cargo area or bow and stern loading/unloading arrangements are to be examined.
- 10. *Drip Trays* Portable and fixed drip trays and insulation for the protection of the deck in the event of cargo leakage are to be examined.
- 11. Gas Burning Installations (1998) Gas burning installations, including instrumentation and safety systems, are to be examined and confirmed in satisfactory operating condition.
- 12. Sealing Arrangements Sealing arrangements on the weather deck in way of openings for the cargo containment system are to be examined.
- 13. Fire Protection and Fire Extinguishing Equipment
  The fire water main equipment, water spray equipment, dry chemical powder fire extinguishing systems in the cargo area, and fixed inerting and fixed smothering installations in gas dangerous spaces are

- to be examined and operationally tested in so far as practicable.
- 14. Electrical Equipment (1998) Electrical equipment in gas dangerous spaces or zones is to be examined. This examination is to include the physical condition of electrical cables and supports, intrinsically safe/explosion proof features of electrical equipment, functional testing of pressurized equipment and associated alarms, testing systems for de-energizing electrical equipment which is not certified for use in gas hazardous areas but which is located in spaces protected by airlocks (e.g. electrical motor rooms or cargo control rooms), and insulation resistance readings of circuits. Where a proper record of testing is maintained, consideration may be given to accepting recent readings.
- 15. Personnel Protection Firemen's outfits, protective clothing, and respiratory protection equipment are to be examined. Decontamination showers and eye wash are to be examined and operationally tested in so far as practicable.
- 16. *Tightness of Hull* Means for detecting leakage into the hold space through ship's structure forming the boundary of hold space are to be examined.
- 17. Operating Instructions Instructions and information material, such as eargo handling plans, loading manual, filling limit information, cooling-down procedure are to be confirmed as being aboard the vessel.
- 18. Electrical Bonding Electrical bonding arrangements on weather deck and in cargo pump rooms, including bonding straps where fitted, of cargo pumping systems carrying flammable liquids and piping systems routed through hazardous areas are to be examined. Bonding to hull, where applicable, of cargo tanks is to be examined.
- 19. Relief Valves (1998) All relief valves in the cargo containment and venting system are to be examined, including protective screens and flame screens if provided, and seals confirmed intact. Records of opening and closing pressures of relief valves are to be confirmed on board. If the cargo tanks are equipped with relief valves with non-metallic membranes in the main or pilot valves, such non-metallic membranes are to be replaced and the valves are to be adjusted, operationally tested and sealed at intervals not exceeding three (3) years.

# 1/3.23.3 Special Periodical Surveys

The following liquefied gas features are to be examined and placed in satisfactory condition together with the conventional Special Periodical Surveys of Hull and Machinery.

# a. Special Periodical Surveys No. 1 and No. 2

- 1. Cargo Tanks (Primary Containers) An internal examination is to be made of all cargo tanks, after being gas freed, including internal mountings and equipment.
- 2. Cargo Tank Supports and Hull Structure Fittings Foundations, chocks, sway braces, keys, anti-flotation arrangements, the secondary barriers or hull plating or both, and framing adjacent to the cargo containment system are to be examined.
- 3. Interbarrier Space Venting System Venting systems, relief valves, or other arrangements provided for

- emergency removal of gas from the interbarrier spaces are to be opened, inspected, tested and readjusted as necessary.
- 4. Cargo Tank Venting System and Liquid-level Indicators Relief valves, liquid-level indicators, and venting systems for the primary cargo containment system are to be examined. All relief valves are to be opened, inspected, tested, and readjusted as necessary. Liquid-level indicators and alarms are to be proven satisfactory. Where a proper record of continuous overhaul and retesting of individually identifiable relief valves is maintained, consideration will be given to acceptance on the basis of opening, internal examination, and testing of a representative sampling of valves including each size of each type of liquefied gas or vapor relief valve in use, provided there is logbook evidence that the remaining valves have been overhauled and tested since the crediting of the previous Special Periodical Survey. The testing and setting of relief valves may be carried out in place or after removal.
- 5. Cargo Handling and Piping Material (1998) All piping, machinery, and equipment for loading, unloading, venting, compressing, refrigerating, liquefying, heating, or otherwise handling the liquefied gas or vapor is to be examined including removal of insulation and opening for examination as deemed necessary. Where deemed suspect, a hydrostatic test to 1.25 times the MARVS for the pipeline is to be carried out. After reassembly, the complete piping is to be tested for leaks. Where water cannot be tolerated and the piping cannot be dried prior to putting the system in to service, the surveyor may accept alternative testing fluids or alternative means of testing. All emergency shut-down valves and remote operating valves in the cargo piping systems are to be inspected and proven operable.
- Insulation Removals Insulation is to be removed in way of any distorted or otherwise suspect structural part of the cargo tanks or elsewhere to carry out any of the previous examinations as required by the Surveyor.
- 7. Gauging Where there is evidence of corrosion, or where one side of the cargo tank, is exposed to possible corrosive atmosphere, the plating of the cargo tanks is to be gauged by nondestructive means to determine the thickness.
- 8. Independent Pressure Tanks Independent pressure vessels for the carriage of liquefied gases, complying with the requirements of Section 4/2, are to be hydrostatically, hydropneumatically or otherwise pressure tested at each Special Periodical Survey. This requirement may be modified at alternate Special Periodical Surveys if the internal and external survey of such pressure vessels indicates no evidence of leakage, distortion, or wastage. The test pressure is to be 1.25 times MARVS.
- Secondary Barriers The secondary barrier is to be checked for its effectiveness by means of a pressure/ vacuum test, a visual inspection, or other acceptable method.
- Non-Destructive Testing In lieu of the requirements in 1/3.23.3.a.8, independent cargo tanks type C are to be subjected to non-destructive testing giving

- special attention to the detection of surface cracks in welded connections in highly stressed areas including at least the following:
- a. cargo tank supports and anti-rolling/anti pitching devices.
- **b.** stiffening rings.
- **c.** Y-connections between tank shell and a longitudinal bulkhead of bilobe tanks.
- d. swash bulkhead boundaries.
- e. dome and sump connections to the tank shell.
- **f.** foundations for pumps, towers, ladders etc.
- g. pipe connections.
- **h.** At alternate Special Survey, at least 10% of the length of the welded connections in each of above mentioned areas is to be tested. This testing is to be carried out internally and externally as applicable. Insulation is to be removed as necessary for the required non-destruction testing.
- i. For independent tanks type B, the extent of the non-destructive testing is to be in accordance with a planned program specially prepared and approved for the cargo tank design.
- 11. Tank Testing Where non-destructive testing, or other evidence such as leakage or distortion, raises doubts as to the structural integrity of a cargo tank, a hydrostatic or hydropneumatic pressure test is to be carried out. For integral tanks and independent tanks type A and B, the test pressure is to be at least MARVS at the top of the tank. For independent tanks type C and pressurized tanks B with MARVS 2.06 bar (2.1 kfg/cm², 30 psi) and over, the test pressure is to be 1.25 times MARVS.
- 12. Electrical Bonding Electrical bonding arrangements, including bonding straps where fitted, of the piping systems located within cargo tanks, ballast tanks, pipe tunnels, cofferdams and void spaces bounding cargo tanks are to be examined.
- 13. *Drainage Arrangements* (1998) Systems for removing water or cargo from interbarrier spaces and holds are to be examined as deemed necessary.
- b. Special Periodical Survey No. 3 and Subsequent Special Periodical Surveys In addition to all the requirements of Special Periodical Survey No. 1 or 2, the following requirements are to be complied with for Special Periodical Survey No. 3 and all subsequent Special Periodical Surveys.
  - 1. Cargo Tanks The plating of at least one cargo tank, including membrane tanks and pressure vessels is to be gauged by nondestructive means to determine the thickness.
  - 2. *Metal Secondary Barriers* The plating of metallic secondary barriers which are structural supports for the primary barrier is to be gauged by nondestructive means to determine the thickness.

#### 1/3.24 Inert Gas Systems

### 1/3.24.1 Annual Surveys for Inert Gas Systems

At each Annual Survey of Machinery the inert gas system is to be generally examined in so far as can be seen and placed in satisfactory condition. The survey is also to include:

a. External examination of all components and piping including scrubber, fans, valves, stand pipe and screens.

- **b.** Confirmation of proper operation of inert gas
- c. Observation of the operation of the scrubber room ventilation system.
- d. Deck seals or double block and bleed assemblies, and non-return valves are to be examined externally and proven in operation. Automatic filling and draining of the deck seal, operation of non-return valves and double block and bleed assemblies, and the water carryover are to be checked.
- **e.** Verify the operation of all remotely operated or automatically controlled valves and, in particular, the flue gas isolating valves.
- f. Verify the operation of the interlocking feature of soot blowers.
- g. Verify the automatic operation of the gas pressure regulating valve.
- **h.** Verify the operation of the following alarms and safety devices using simulated conditions where necessary:
- 1. Flue Gas Systems
  - a. Low water pressure or low water flow rate to the flue gas scrubber
  - b. High water level in the flue gas scrubber
  - c. High gas temperature at IGS blower discharge
  - d. Failure of the inert gas blowers
  - e. Oxygen content in excess of 8% by volume
  - f. Failure of the power supply to the automatic control system for the gas regulating valve and to the oxygen content and gas pressure indicating devices.
  - g. Low water level in the water seal
  - $\check{h}$ . Gas pressure less than 100 mm water
  - i. High gas pressure gauge
- j. Accuracy of fixed and portable oxygen measuring equipment by means of a calibration gas
- 2. Gas Generating Systems
  - a. Low water pressure or low water flow rate to the flue gas scrubber
  - b. High gas temperature
  - c. Oxygen Content in excess of 8% by volume
  - d. High gas pressure
  - e. Insufficient fuel oil supply
  - f. Failure of the power supply to the generator
  - g. Failure of the power supply to automatic control system for the generator
  - h. Accuracy of fixed and portable oxygen measuring equipment by means of a calibration gas
- i. The Surveyor is to examine the permanent records to verify the operation and maintenance of the system. Consideration may be given by the Surveyor for the crediting of certain items that have been properly documented and recorded.

# 1/3.24.2 Special Periodical Surveys for Inert Gas Systems

In conjunction with the Special Periodical Survey of Machinery, the following items of the Inert Gas System are to be examined and placed in satisfactory condition.

a. All valves, including valves at boiler uptakes, air seal valves at uptakes, scrubber isolating valve, fans inlet

- and outlet isolating valves, main isolating valve, recirculating valve (if fitted), pressure/vacuum breaker and cargo tank isolating valves are to be examined.
- **b.** Scrubber is to be examined.
- c. Fans (blowers) including casing drain valves are to be examined.
- **d.** Fan (blower) drives, either electric motor or steam turbine.
- e. Bellows expansions pieces are to be examined.
- f. Sea water pumps, valves and strainers for scrubbers and water seals together with piping connections at the scrubber, water seals, shell plating and the remainder of the sea water piping are to be examined.
- g. Stand pipe, where fitted, for purging in each cargo tank is to be examined.
- **h.** Deck Seals or double block and bleed assemblies, and non-return valves are to be examined externally and internally.

# 1/3.24.4 Separate Inert Gas Generator System

Surveys for separate inert gas generator systems are to comply with all applicable requirements for Special Periodical Surveys given in 1/3.24.2, together with the following:

- **a.** Automatic combustion control system is to be examined and tested as necessary.
- **b.** Combustion chamber and mountings are to be examined internally and externally.
- c. Forced draft fan is to be examined.
- **d.** Fuel oil service pumps are to be examined.

#### 1/3.24.5 Gas Stored in Bottles System

Systems using inert gas stored in bottles are to comply with all applicable requirements for Special Periodical Surveys given in 1/3.24.2 together with the following:

- a. Bottles are to be examined internally. If they cannot be examined internally, they are to be gauged. When considered necessary by the Surveyor, they are to be hydrostatically tested. Relief valves are to be proven operable.
- **b.** Where an alkali (or other) scrubber is fitted in the system the scrubber, circulating pump, valves and piping are to be examined internally and externally.

# TABLE 1/3.1 Minimum Requirements for Thickness Gaugings for Vessels Under 90 Meters (295 feet) in Length

Special Periodical Survey

Number 1

Special Survey Number 2

1) Suspect areas throughout the vessel.

Special Periodical Survey Number 3

- 1) Suspect areas throughout the vessel.
- 2) Two girth belts of shell and deck within the amidships 0.5L in way of two different cargo (or ballast) tanks where fitted, together with internals in way.

Special Periodical Surveys Number 4 and Subsequent

- 1) Suspect areas throughout the vessel
- 2) Three girth belts of shell and deck within the amidships 0.5L, avoiding those tanks previously gauged, together with internals in way.
- 3) Two wind-and-water strakes, port and starboard, full length.
- 4) All exposed main deck and superstructure deck plating.
- 5) Flat keel plating full length. Also, additional bottom plates in way of cofferdams, machinery spaces, and aft end of tanks.
- 6) For tank vessels, gauging of principal internals throughout cargo and ballast tanks.

#### Notes

- 1 With reference to cargo/ballast history and arrangement and condition of coatings, tanks and specific thickness gauging locations should be selected which will provide the best representative sampling of areas likely to be most exposed to corrosion effects.
- 2 Gauging requirements in way of internals may be modified at the discretion of the Surveyor if the structure remains effectively protected against corrosion by a permanent type special coating.
- 3 (1998) In any case where extensive area of wastage is found, thickness gauging is to be carried out.

# TABLE 1/3.2 Minimum Requirements for Thickness Gaugings at Special Periodical Surveys of Tankers without ESP Notation

Special Periodical Survey Number 1	Special Survey Number 2	Special Periodical Survey Number 3	Subsequent Special Periodical Surveys
1) One transverse belt of deck plating for the full beam of the ship within amidships 0.5L.	1) All main deck plates within the amidships 0.5L or cargo tank section, whichever is longer.	1) All main deck plates within the amidships 0.5L or cargo tank section, whichever is longer.	1) All exposed main deck plates, full length. Also, exposed 1st tier superstructure deck plates (poop bridge & forecastle decks).
2) Suspect areas throughout the vessel.	2) One transverse belt of bottom and sideshell plating within 0.5L.	2) Two transverse belts of deck, bottom, sideshell and top and bottom strakes of longitudinal bulkhead plating within the amidships 0.5L together with attached longitudinal members in way of belts.	2) All keel plates full length. Also additional bottom plates in way of cofferdams, machinery space, and aft end of tanks.
	3) Plates in wind-and-water strakes outside 0.5L.	3) Plates in wind-and-water strakes outside 0.5L.	3) A minimum of three transverse belts of deck, bottom, sideshell and longitudinal bulkhead plating within the amidships 0.5L together with attached longitudinal members in way.
	4) Plating and stiffeners of transverse bulkheads and internals in forepeak, ballast and afterpeak tanks.	4) Plating and stiffeners of transverse bulkheads and internals in forepeak, ballast, cargo, and afterpeak tanks.	4) Plating and stiffeners of transverse bulkheads and internals in forepeak, ballast, cargo, and afterpeak tanks.
	5) Suspect areas throughout vessel.	5) Suspect areas throughout vessel.	5) All plates in two wind-and-water strakes, port and starboard, full length.
			6) Suspect areas throughout vessel.

- 1 With reference to cargo/ballast history and arrangement and condition of coatings, tanks and specific thickness gauging locations should be selected which will provide the best representative sampling of areas likely to be most exposed to corrosion effects.
- 2 Gauging requirements in way of internals may be modified at the discretion of the Surveyor if the structure remains effectively protected against corrosion by a permanent type special coating.
- 3 (1998) In any case where extensive area of wastage is found, thickness gauging is to be carried out.
- 4 Above requirements are to be applied as applicable to gas carriers and independent tank carriers.

# TABLE 1/3.3 Minimum Requirements for Thickness Gaugings for Dry Cargo Vessels

Number 1	,	Periodical	Survey
ivamber i		Number 1	

### Special Survey Number 2

# Special Periodical Survey Number 3

### Subsequent Special Periodical Surveys

- 1) Suspect areas throughout the vessel.
- 1) Suspect areas throughout the vessel.
- 2) One girth belt of deck plating abreast a cargo hatch opening within the amidships 0.5L.
- 1) Suspect areas throughout the vessel.
- 2) Two girth belts of deck, bottom and side plating within the amidships 0.5L abreast two different hatch openings, together with internals in way of belts.
  - 3) Internals in forepeak tank.
- 1) Suspect areas throughout the vessel.
- 2) A minimum of three girth belts of deck, bottom, side, and longitudinal bulkhead plating in way of cargo holds within the amidships 0.5L together with longitudinal and adjacent internals in way of belts.
- 3) Internals in forepeak and after peak tanks.
- 4) Lowest strake and strakes in way of 'tween decks of all transverse bulkheads in cargo spaces.
- 5) All plates in two wind-and-water strakes, port and starboard, full length.
- 6) All exposed main deck plating full length and all exposed first-tier superstructure deck plating (poop, bridge and forecastle decks).
- 7) All keel plates full length. Also, additional bottom plates in way of cofferdams, machinery space, and aft end of tanks.
- 8) Duct keel or pipe tunnel plating and internals.

# Notes:

- 1 With reference to cargo/ballast history and arrangement and condition of coatings, tanks and specific thickness gauging locations should be selected which will provide the best representative sampling of areas likely to be most exposed to corrosion effects.
- 2 Gauging requirements in way of internals may be modified at the discretion of the Surveyor if the structure remains effectively protected against corrosion by a permanent type special coating.
- 3 (1998) In any case where extensive area of wastage is found, thickness gauging is to be carried out.

# TABLE 1/3.4 Tail Shaft Survey Interval (in years)

Type of service and design	Single Screw	Multiple Screw
1. Fresh Water Exclusively a. Water-Lubricated • 1	5	
b. Oil-Lubricated $^{\bullet 2}$	5	
2. Fresh Water and Sea Water a. Water-Lubricated • 1		4 (5 <sup>•3</sup> )
i) Cont. Liner or equivalent	3 (5 <sup>•3</sup> )	
ii) All Other Shafts	3	4
b. Oil-Lubricated $^{ullet}$	5	

#### Note $^{ullet}$

- For water lubricated bearings, an extension of up to one year may be considered, when requested
  by the Owner, on the basis of satisfactory service record and an external examination of the inboard
  and outboard tailshaft assemblies together with a bearing wear down check at the end of the normal
  survey period. A survey will be required for this extension.
- 2. a) For oil lubricated bearings, up to two (2) separate extensions of approximately one (1) year each may be considered when requested by the Owner, on the basis of satisfactory service and oil loss records, an external examination of the inboard and outboard seal assemblies, and an examination of oil sample at the time of granting each requested extension with a confirmation at the fifth year that bearing wear down is within allowable limits. A survey will be required for each extension.
  - b) In lieu of up to two (2) extensions of one (1) year each in 2a above, one (1) extension not exceeding five (5) years may be considered when requested by the owner provided a survey consisting of the following is carried out at the fifth year.
  - i) verification of satisfactory service including records of oil loss.
  - ii) oil sample examination and test.
  - iii) verification of no reported repairs by grinding or welding.
  - iv) bearing weardown measurement (see 1/3.2.1c).
  - v) verification that propeller is free of damages which may cause the propeller to be out of
  - vi) bearing outboard seals are to be renewed and the seal liner found to be or placed in a satisfactory condition.
  - vii) bearing inboard seal assemblies are to be externally examined and found to be or placed in a satisfactory condition.
- 3. Applicable to tailshafts protected by a continuous metallic liner, or continuous cladding per 4/7.27.8 or fiberglass reinforced plastic coating between liners installed according to approved procedure per 4/7.27.7 which effectively prevents seawater from contacting the steel shaft, or which have shafts of corrosion-resistant materials; the survey interval is five years, provided that in addition to the propeller hub details given in Section 4/7, the design includes other features that would further reduce stress concentrations in the propeller assembly.

# Vessels in Great Lakes Service

#### 1/3.25 General Conditions

Except as noted below, the requirements of 1/3.1 through 1/3.24 apply to Great Lakes vessels. Special consideration may be given where justified by special circumstances.

Note: Owners should be cautioned that Load Line Certificate validity period may limit application of extended class survey interval. Paragraph 1/3.3.1 is not applicable to Great Lakes Service.

Surveys falling due during January, February and March, when the vessel is in normal winter lay-up, may be considered deferred but must be completed before the vessel returns to operation.

# 1/3.25.1 Annual Surveys (Replaces 1/3.5.1)

Annual Surveys are to be made during each year of service.

1/3.25.2 Intermediate Surveys (Replaces 1/3.5.3) Intermediate Surveys are to be carried out at or between the second or third Annual Survey.

# 1/3.25.3 Special Periodical Surveys (Replaces 1/ 3.5.5)

The first Special Periodical Survey becomes due five years after the date of build. Subsequent Special Periodical Surveys are due five years after the crediting date of the previous Special Periodical Survey. If a Special Periodical Survey is not completed at one time, it will be credited as of the completion date of the survey but no later than six years from date of build or from the date recorded for the previous Special Periodical Survey. The Special Survey of Hull credit date and the date for renewal of the Load Line certificate will be the last day of the month when the vessel last visited on drydock for credited Special Survey Drydocking as long as no item for Special Survey of Hull is overdue.

# 1/3.25.4 Continuous Surveys (Replaces 1/3.5.7)

a. At request of the Owner, and upon approval of the proposed arrangements, a system of Continuous Surveys may be undertaken, whereby the Special Periodical Survey requirements are carried out in regular rotation to complete all the requirements of the particular Special Periodical Survey within a five-year period. Each part (item) surveyed becomes due again for survey approximately five years from the date of the survey and the due parts (items) are generally to be completed each year. The Annual Survey will not be credited and the Certificate of Classification will not be endorsed unless Continuous Survey items which are due or overdue at the time of the Annual Survey are either completed or granted an extension. For Continuous Surveys, a suitable notation will be entered in the Record and the date of the completion of the cycle published. If any defects are found during the survey, they are to be dealt with to the satisfaction of the Surveyor. The continuous survey credit date and date for renewal of the Load Line Certificate will be the last day of the month when the vessel was last visited on drydock for credited Special Survey

- Drydocking as long as no item for Continuous Survey of Hull is overdue.
- b. At a survey approximately two to three years after entering service and after each subsequent Continuous Hull Survey has been credited, vessels will require the equivalent of an Intermediate Survey. Vessels on the Continuous Hull Survey Program where 20% of the ballast tanks and cargo holds are examined and reported satisfactory each year would not be required to carry out Intermediate Survey.

#### 1/3.25.5 Year of Grace

- a. (1998) To be eligible for the year of grace to complete the Special Periodical Survey within one year after the due date, the vessel is to be presented for survey up to a maximum of three months prior to the Special Periodical Survey due date. The survey may be commenced earlier than the above specified three months, provided it is commenced while the vessel is in a continuous lay-up that extends to the date of the maximum 3 month limit. The requirements for surveys to qualify for a period of grace will normally include the internal examination of peaks, some ballast tanks and cargo holds. Outstanding recommendations are to be reexamined and found or placed in a condition acceptable to the attending Surveyor.
- **b.** If the Year of Grace Survey is satisfactory, the completion of the Special Periodical Survey may be deferred for a period not exceeding twelve months, provided the whole Special Periodical Survey is satisfactorily completed within six years from date of build or from the date recorded for the previous Special Periodical Survey.

# 1/3.25.6 Lay-up and Reactivation

- **a.** See 1/3.3.7a.
- **b.** See 1/3.3.7b.
- c. Where the lay-up preparations and procedures have been submitted to the Bureau for review and verified by Annual Lay-up Surveys, consideration may be given to deducting part or all of the time in lay-up from the progression of survey intervals.

When applying for deductions, Owners are to provide details or out of service intervals since last credited surveys which do not include the normal winter lay-up months of January, February, and March.

**d.** See 1/3.3.7d.

# 1/3.25.7 Drydocking Survey

- a. Interval For vessels Classed Great Lakes Service, operating solely within the recognized boundaries for Great Lakes voyages, the regular interval is five years. Consideration may be given to any special circumstances justifying an extension of the regular interval. When a satisfactory Year of Grace Survey has been carried out, including additional examinations afloat as may be deemed necessary by the attending Surveyor, this regular interval can be extended to a maximum of six years. See Note under 1/3.25.
- **b.** See 1/3.7.7.
- c. After satisfactory external examination of the nonmetallic expansion pieces in the main sea-water circu-

lating system the internal examination may be waived by the attending Surveyor. However, the Surveyors are to be notified should such non-metallic expansion pieces become accessible for internal examination.

# 1/3.27 Annual Surveys-Hull (See 1/3.7.1)

All parts of 1/3.7.1 apply to Great Lakes vessels.

### 1/3.29 Intermediate Surveys (See 1/3.25.2)

# 1/3.29.1 All Vessels

In addition to the requirements of 1/3.27 the following are required:

- a. For bulk carriers this survey is to include examination of the hatch side girders and/or upper deck plating inside the hatch coaming together with associated internals so far as can be seen.
- b. At least three ballast tanks, one peak tank and two cargo holds are to be internally examined. Where substantial corrosion or structural damage is found the remaining spaces may also be required to be examined.

# 1/3.31 Special Periodical Surveys—Hull (See 1/ 3.7.9)

# 1/3.31.1 All Special Periodical Surveys

- a. At the discretion of the Surveyor, the testing of tanks required by 1/3.7.9l may be waived for tanks other than cargo tanks for tankers provided an internal examination is carried out, where required elsewhere, together with an examination of the tank top.
- **b.** Paragraph 1/3.7.9k does not apply to Great Lakes vessels.
- **c.** Any part of the vessel where wastage is evident or suspect, the Surveyor may require thickness gaugings in order to obtain the actual thickness of the material.
- **d.** The vessel is to be placed in a drydock and all items of 1/3.25.7 are to be examined.

# 1/3.31.2 Special Periodical Survey No. 3 and Subsequent

- a. For Great Lakes vessels having the additional St. Lawrence River Service notation and operating in the St. Lawrence River, particular attention is directed to unprotected ballast tanks. Where extensive corrosion is found, thickness measurement is to be carried out.
- **b.** For Great Lakes vessels designed for and granted restricted service into the Gulf of St. Lawrence, and which are found with extensive corrosion, thickness measurement is to be carried out that may be equal to those required for full Ocean service.

# 1/3.31.3 Special Periodical Surveys Subsequent to No. 6

As a minimum, at least one belt near amidships to include deck, sideshell, bottom and internals in way, are to be gauged.

# 1/3.32 Special Periodical/Continuous Survey of Machinery - Year of Grace (see 1/3.11) (1998)

When the Owner applies for a Year of Grace Survey, this will also apply to the Special Continuous or Periodical Survey of Machinery items that are not normally examined with the vessel afloat, such as the controllable pitch propeller system, main drive shaft couplings, thrust bearings, sea valves and chests, etc. Upon external examinations and review of records to the satisfaction of the attending Surveyor, such items may also be granted the Year of Grace Survey.

# 1/3.33 Tailshaft Surveys (Replaces 1/3.5.13 and 1/ 3.11)

### 1/3.33.1 Survey Intervals

- a. The regular interval for Tailshaft Survey is five years and is intended to coincide with Special Periodical Survey, including Year of Grace when recommended, subject to such additional examinations afloat as deemed necessary by the attending Surveyor.
- The interval for Tailshaft Surveys are to be the same as that required for Special Periodical Surveys. Where arrangements are such as to permit effective examination of the forward end of the taper and keyway to the satisfaction of the Surveyor in accordance with 1/3.11.1, the shaft need not be drawn for examination in its entirety. Where arrangements of the flanged tailshaft permits effective examination of the flange fillet by a surface crack detection method, bearing weardown measurement, and shaft seal effectiveness (oil-lubricated bearings), the shaft need not be withdrawn. The flange coupling bolts are to be examined by means of a surface crack detection method whenever they are removed. The C-P propeller hub is to be tested under operating conditions for oil tightness.

#### 1/3.33.2 Allowable Bearing Weardown

- a. Water-lubricated Bearings Other than Rubber The after bearing is to be rebushed when it is worn down to 5/16 in. clearance in the case of shafts 9 in. or less in diameter, 3/8 in. in clearance where the diameter is above 9 in. but not more than 12 in., and 1/2 in. clearance where the shaft exceeds 12 in. in diameter.
- **b.** Rubber and Oil-lubricated Bearings See 1/3.11.3.

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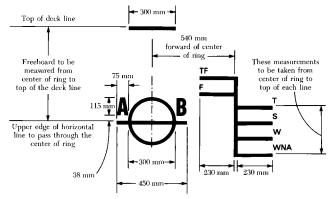
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# Part 1 Appendix 1/A Load Line Marks

# Load Line Markings for Oceangoing Vessels

# **Millimeters**

The American Bureau of Shipping is authorized to assign Load Lines to vessels registered in the United States and other countries. Requests for the assignment of Load Lines are to be made on forms which will be furnished by one of the offices of the Bureau.



Thickness of all lines 25 mm

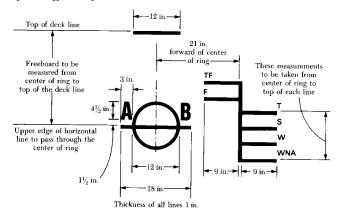
The center of the ring is to be placed on each side of the vessel at the middle of the length as defined in the Load Line Regulations. The ring and lines are to be permanently marked, as by center punch, chisel cut or bead of weld.

AB	American Bureau of Shipping
TF	Tropical Fresh Water Allowance
F	Fresh Water Allowance
T	Load Line in Tropical Zones
S	Summer Load Line
W	Winter Load Line
WNA	Winter North Atlantic Load Line

# Load Line Markings for Oceangoing Vessels

# **Inches**

The American Bureau of Shipping is authorized to assign Load Lines to vessels registered in the United States and other countries. Requests for the assignment of Load Lines are to be made on forms which will be furnished by one of the offices of the Bureau.



The center of the ring is to be placed on each side of the vessel at the middle of the length as defined in the Load Line Regulations. The ring and lines are to be permanently marked, as by center punch, chisel cut or bead of weld.

AB	American Bureau of Shipping
TF	Tropical Fresh Water Allowance
F	Fresh Water Allowance
Т	Load Line in Tropical Zones
S	Summer Load Line
W	Winter Load Line
WNA	Winter North Atlantic Load Line

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# Part 1 Appendix 1/B Hull Surveys of Oil Tankers

# Foreword

Regulation 13G in Annex 1 to 1973/78 MARPOL Convention, adopted by the Marine Environmental Protection Committee (MEPC) of IMO on 6 March 1992 and effective on 6 July 1995, requires in paragraph (3) that an oil tanker to which that Convention applies be subjected to an enhanced survey program of inspection during special, intermediate and annual surveys, in addition to other requirements such as maintaining aboard complete files of survey reports, etc.

IACS in turn developed unified requirements UR Z10.1 Hull Surveys of Oil Tankers which were submitted to IMO as guidelines in implementing these IMO requirements, more specifically to MEPC 33 meeting 26–30 October 1992

During this MEPC meeting, a joint working group of MSC/MEPC was convened which produced a draft Guidelines on Enhanced Programme of Surveys for Oil Tankers, identified as Annex I to MEPC 33/WP.8 dated 29 October 1992.

MEPC 33 duly noted the proposed draft Guidelines and instructed the working group to hold further sessions concurrent with MSC 61 (December 1992) and MSC 62 (May 1993) for further review and resubmission of draft Guidelines to MEPC 34 in July 1993.

IMO Resolution A. 744 (18), "Guidelines on the Enhanced Programme of Inspections During Surveys of Bulk Carriers and Oil Tankers", was adopted on 4 November 1993. This Appendix, originally implemented on 1 January 1993, incorporates IMO Resolution A.744 (18) as appropriate.

It should be noted that this Appendix is in addition to the requirements in other parts of the Rules including those in Part 1 Section 3—"Surveys after Construction".

# Hull Surveys of Oil Tankers

#### 1/B.1. General

# 1/B.1.1 Application

**1/B.1.1.1** These requirements apply to hull surveys after construction of all self-propelled oil tankers.

**1/B.1.1.2** These requirements apply to surveys of hull structure and piping systems in way of cargo tanks, pump rooms, cofferdams, pipe tunnels, void spaces within the cargo area and all ballast tanks. These requirements are additional to the requirements elsewhere in the Rules.

**1/B.1.1.3** These requirements contain the extent of examination, thickness measurements and tank testing. The survey will be expanded when substantial corrosion and/or structural defects are found and will include additional Close-up Survey when necessary.

#### 1/B.1.2 Definitions

**1/B.1.2-1** An *Oil Tanker* is a ship which is constructed primarily to carry oil in bulk and includes a ship of similar types such as combination carrier (Ore/Oil), etc.

**1/B.1.2-2** *Oil* for the purpose of this Appendix means petroleum in any form including crude oil, fuel oil, sludge, oil refuse and refined products, other than petrochemicals which are subject to the provisions of Annex II of the MARPOL 73/78.

**1/B.1.2.1** A *Ballast Tank* is a tank which is used for salt water ballast and includes segregated ballast tanks, ballast double bottom spaces and peak tanks. A tank which is used for both cargo and ballast will be treated as a ballast tank when substantial corrosion has been found in that tank.

**1/B.1.2.2** An *Overall Survey* is a survey intended to report on the overall condition of the hull structure and to determine the extent of additional Close-up Surveys.

**1/B.1.2.3** A *Close-up Survey* is a survey where the details of structural components are within the close visual inspection range of the Surveyor, i.e. normally within hand's reach.

**1/B.1.2.4** A *Transverse Section* includes all longitudinal members such as plating, longitudinals and girders at the deck, side, bottom, inner bottom and longitudinal bulkheads.

**1/B.1.2.5** Representative Tanks are those which are expected to reflect the condition of other tanks of similar type and service and with similar corrosion prevention systems. When selecting representative tanks account should be taken of the service and repair history onboard and identifiable critical and/or suspect areas.

**1/B.1.2.6** Suspect Areas are locations showing substantial corrosion and/or are considered by the Surveyor to be prone to rapid wastage.

**1/B.1.2.7** Substantial Corrosion is an extent of corrosion such that assessment of corrosion pattern indicates a wastage in excess of 75% of the allowable margins, but within the acceptable limits.

Note: Wastage allowances may be found in "Guide for Preparation for Special Survey".

**1/B.1.2.8** Corrosion Prevention System is normally to be a full hard coating which may or may not be supplemented by anodes. Other coating systems may be considered ac-

ceptable as alternatives provided that they are applied in compliance with the manufacturer's specification and properly maintained.

Soft Coatings—Where soft coatings have been applied, safe access is to be provided for the Surveyor to verify the effectiveness of the coating and to carry out an assessment of the conditions of the internal structures which may include spot removal of the coating. When safe access cannot be provided, the soft coating is to be removed.

**1/B.1.2.9** Coating Condition is defined as follows:

GOOD condition with only minor spot rusting.

FAIR condition with local breakdown at edges of stiffeners and weld connections and/or light rusting over 20% or more of areas under consideration, but less than as defined for POOR condition.

POOR condition with general breakdown of coating over 20% or more of areas or hard scale at 10% or more of areas under consideration.

**1/B.1.2.10** Critical Structural Areas are locations which have been identified from calculations to require monitoring or from the service history of the subject ship or from similar or sister ships to be sensitive to cracking, buckling or corrosion which would impair the structural integrity of the ship.

**1/B.1.2.11** Cargo area is that part of the ship that contains cargo tanks, slop tanks and cargo pump-rooms; including pump-rooms, cofferdams, ballast, and void spaces adjacent to cargo tanks; and also deck areas throughout the entire length and breadth of the part of the ship over the above-mentioned spaces.

# 1/B.1.3 Scope of Surveys

**1/B.1.3.1** Prior to inspection the Surveyor is to examine the completeness of documentation on board, and its contents as a basis for the Survey.

1/B.1.3.2 When an annual, intermediate or special survey results in the identification of significant corrosion or of significant structural defects which, in the opinion of the Surveyor, will impair the structural integrity of the ship, then remedial action, in consultation with the Bureau should be agreed and implemented before the ship continues in service.

#### 1/B.2 Special Survey

# 1/B.2.1 General

**1/B.2.1.1** The Special Survey may be commenced at the fourth Annual Survey and be progressed with completion by the fifth anniversary date.

**1/B.2.1.2** As part of the preparation for the Special Survey, the thickness measurement and Survey Program should be dealt with in advance of the Special Survey. The thickness measurements taken during or after the fourth Annual Survey will be credited towards the Special Survey.

**1/B.2.1.3** The Special Survey is to include, in addition to the requirements of the Annual Survey, examination tests and checks of sufficient extent to ensure that the hull and related piping are in a satisfactory condition and are fit for their intended purpose for the next five-year period subject to proper maintenance and operation and to periodical surveys being carried out at the due dates.

1/B.2.1.4 All cargo tanks, ballast tanks, pumprooms, pipe tunnels, cofferdams and void spaces bounding cargo tanks, decks and outer hull are to be examined. This examination is to be supplemented by thickness measurement and testing as deemed necessary, to ensure that the structural integrity remains effective. The examination is to be sufficient to discover substantial corrosion, significant deformation, fractures, damages or other structural deterioration. 1/B.2.1.5 All piping systems within the above tanks and spaces are to be examined and operationally tested under working conditions to ensure that tightness and condition remain satisfactory. Special attention is to be given to any ballast piping in cargo tanks and any cargo piping in ballast tanks and void spaces.

**1/B.2.1.6** The survey extent of combined ballast/cargo tanks is to be evaluated based on the records of ballast history and extent of the corrosion prevention system provided and extent of corrosion found.

#### 1/B.2.2 Drydock Survey

1/B.2.2.1 A survey in drydock is to be a part of the Special Survey.

# 1/B.2.3 Tank Protection

1/B.2.3.1 (1998) Where provided, the condition of coating or corrosion prevention system of cargo tanks and ballast tanks is to be examined.

Tanks used for salt water ballast where a protective coating is found in POOR condition as defined in 1/B.1.2.9 and the owners or their representatives elected not to restore the coating, where soft coating has been applied, or where a protective coating has not been applied are to be internally examined at each subsequent Annual Survey.

Where extensive areas of wastage are found, thickness measurements are to be carried out and renewals made when wastage exceeds allowable margins.

### 1/B.2.4 Extent of Overall and Close-up Survey

**1/B.2.4.1** An Overall Survey of all tanks and spaces is to be carried out at Special Survey. For fuel oil tanks the necessity for the Overall Survey is to be determined based on the ship's age.

**1/B.2.4.2** The requirements for Close-up Surveys at Special Survey are given in Table 1/B.1.

1/B.2.4.3 The Surveyor may extend the Close-up Survey as deemed necessary, taking into account the maintenance of the tanks under survey, the condition of the corrosion prevention system, with particular attention being given to the following situations:

- Tanks having structural arrangements or details which have suffered defects in similar tanks or on similar ships according to available information,
- In tanks which have structures approved with reduced scantlings due to an approved corrosion control system.

**1/B.2.4.4** For areas in tanks where coatings are found to be in GOOD condition as defined in 1/B.1.2.9, the extent of Close-up Surveys according to Table 1/B.1 may be specially considered.

#### 1/B.2.5 Extent of Thickness Measurement

**1/B.2.5.1** The requirements for thickness measurements at Special Survey are given in Table 1/B.2.

1/B.2.5.2 (1998) Where substantial corrosion as defined in 1/B.1.2.7 is found, additional thickness measurements are to be carried out in accordance with Table 1/B.4.

**1/B.2.5.3** The Surveyor may require further thickness measurements as deemed necessary.

1/B.2.5.4 (1998) Where coatings are found to be in GOOD condition as defined in 1/B.1.2.9, the extent of thickness measurements of structural members subject to Close-up Surveys required according to Table 1/B.2 may be modified by the Surveyor. After Special Survey No. 2, modification of the extent of thickness measurements of structural members subject to Close-up Surveys is to be specially considered.

1/B.2.5.5 Transverse sections should be chosen from the section where the largest reductions are suspected to occur or are revealed from deck plating measurements.

1/B.2.5.6 In cases where two or three sections are to be measured, at least one should include a ballast tank within 0.5L amidships.

# 1/B.2.6 Extent of Tank Testing

**1/B.2.6.1** The requirements for tank testing at Special Survey are given in Table 1/B.3.

1/B.2.6.2 Tanks are to be tested with a head of liquid to the top of access hatches for cargo tanks, or top of air pipes for ballast tanks.

### 1/B.3 Intermediate Survey (1998)

**1/B.3.1** The Intermediate Survey, which includes the following items, is to be carried out either at or between the second and third Annual Surveys.

- a) Weather decks An examination as far as practical of cargo, crude oil washing, bunker, ballast, steam and vent piping systems as well as vent masts and headers. If upon examination there is any doubt as to the condition of the piping, the piping may be required to be pressure tested, thickness measured, or both.
- Överall, Close-up and Thickness Measurements See Table 1/B.10 for requirements according to vessels age.

1/B.3.2 Tanks used for salt water ballast where a protective coating is found in POOR condition as defined in 1/B.1.2.9 and the Owners or their representatives elected not to restore the coating, where soft coating has been applied, or where a protective coating has not been applied, are to be internally examined at each subsequent Annual Survey.

1/B.3.3 Where extensive areas of wastage are found, thickness measurements are to be carried out and renewals made when wastage exceeds allowable margins.

### 1/B.4 Annual Survey

#### 1/B.4.1 General

**1/B.4.1.1** The survey is to consist of an examination for the purpose of ensuring, as far as practical, that the hull

and piping are maintained in a satisfactory condition and is to take into account the following:

- a) service history,
- b) condition and extent of the corrosion prevention system of ballast tanks,
- c) areas identified in the Survey Report Files.

# 1/B.4.2 Examination of the Hull

**1/B.4.2.1** Examination of the hull plating and its closing appliances as far as can be seen (including 1/B.4.3 through 1/B.4.5).

**1/B.4.2.2** Examination of watertight penetrations as far as practicable.

#### 1/B.4.3 Examination of Weather Decks

**1/B.4.3.1** Examination of cargo tank openings including gaskets, covers, coamings and flame screens.

1/B.4.3.2 Examination of cargo tank pressure/vacuum valves and flame screens.

**1/B.4.3.3** Examination of flame screens on vents to all bunker, oily ballast and oily slop tanks.

**1/B.4.3.4** Examination of cargo, crude oil washing, bunker and vent piping systems, including vent masts and headers.

# 1/B.4.4 Examination of Cargo Pump Rooms and Pipe Tunnels

1/B.4.4.1 Examination of all bulkheads for signs of oil leakage or fractures and, in particular, the sealing arrangements of all penetrations of bulkheads.

**1/B.4.4.2** Examination of the condition of all piping systems and pipe tunnels.

# 1/B.4.5 Examination of Ballast Tanks

1/B.4.5.1 (1998) Examination of ballast tanks when required as a consequence of the results of the Special Survey or Intermediate Survey. Where extensive areas of wastage are found, thickness measurements are to be carried out and renewals and/or repairs made when wastage exceeds allowable margins.

1/B.4.5.2 (1998) Examination of all ballast tanks where substantial corrosion is documented. Thickness measurements are to be taken to confirm condition of substantially corroded areas and renewals and/or repairs made when wastage exceeds allowable margins.

# 1/B.5 Preparations for Special Survey

### 1/B.5.1 Planning

1/B.5.1.1 Survey planning is to be worked out in advance of each Special Survey by the Owner in cooperation with the Bureau. The Survey Plan shall be in a written format. 1/B.5.1.2 The following documentation should be collected and consulted with a view to selecting tanks, areas, and structural elements to be examined:

- Survey status and basic ship information,
- Documentation on-board, as described in 1/B.6.2 and 1/B.6.3
- Main structural plans, including information regarding use of higher strength steels,
- Relevant previous survey and inspection reports from both the Bureau and the Owner,

- Information regarding the use of the ship's tanks, typical cargoes and other relevant data,
- Information regarding corrosion protection level on the new building,
- Information regarding the relevant maintenance level during operation.

1/B.5.1.3 Survey planning is to account for and comply with the requirements of Tables 1/B.1, 1/B.2 and 1/B.3 for Close-up Survey, thickness measurement and tank testing, respectively, and is to consider relevant information including at least:

- Basic ship information and particulars,
- Main structural plans, including information regarding use of higher strength steels,
- Plan of tanks,
- List of tanks with information on use, protection and condition of coating,
- Conditions for survey (e.g., information regarding tank cleaning, gas freeing, ventilation, lighting, etc.),
- Provisions and methods for access to structures,
- Equipment for surveys,
- Tanks and areas selected for Close-up Survey (per Table 1/B.1),
- Structures selected for thickness measurement (per Table 1/B.2),
- Tanks selected for tank testing (per Table 1/B.3),
- Damage experience related to the vessel.

**1/B.5.1.4** The Bureau will advise the Owner of the maximum acceptable structural wastage allowances applicable to the vessel.

**1/B.5.1.5** Guidelines for Technical Assessment in Conjunction with Planning for Enhanced Surveys of Tankers, contained in Annex 1/B.2, may be referred to in conjunction with the planning preparation.

Where considered necessary and appropriate by the Bureau, these Guidelines will be made mandatory.

### 1/B.5.2 Conditions for Survey

**1/B.5.2.1** The Owner is to provide the necessary facilities for a safe execution of the survey.

1/B.5.2.2 Tanks and spaces are to be safe for access, i.e. gas freed, ventilated, etc.

**1/B.5.2.3** Tanks and spaces are to be sufficiently clean and free from water, scale, dirt, oil residues, etc. to reveal significant corrosion, deformation, fractures, damages or other structural deterioration. In particular this applies to areas which are subject to thickness measurement.

**1/B.5.2.4** Sufficient illumination is to be provided to reveal significant corrosion, deformation, fractures, damages or other structural deterioration.

### 1/B.5.3 Access to Structures

**1/B.5.3.1** For Overall Survey, means are to be provided to enable the Surveyor to examine the tank structure in a safe and practical way.

**1/B.5.3.2** For Close-up Survey, one or more of the following means for access, acceptable to the Surveyor, is to be provided:

- a) permanent staging and passages through structures,
- b) temporary staging and passages through structures,
- c) lifts and moveable platforms,
- d) boats or rafts,
- e) other equivalent means.

1/B.5.4 Equipment for Survey

1/B.5.4.1 Thickness measurement is normally to be carried out by means of ultrasonic test equipment. The accuracy of the equipment is to be proven to the Surveyor as required.

1/B.5.4.2 One or more of the following fracture detection procedures may be required if deemed necessary by the Surveyor:

- a) radiographic equipment,
- b) ultrasonic equipment,
- c) magnetic particle equipment,
- d) dye penetrant.

#### 1/B.5.5 Survey at Sea or at Anchorage

**1/B.5.5.1** Survey at sea or at anchorage may be accepted provided the Surveyor is given the necessary assistance from the personnel onboard. Necessary precautions and procedures for carrying out the survey are to be in accordance with 1/B.5.1, .5.2, .5.3 and .5.4.

**1/B.5.5.2** A communication system is to be arranged between the survey party in the tank and the responsible officer on deck. This system must also include the personnel in charge of ballast pump handling if boats or rafts are used.

**1/B.5.5.3** Explosimeter, oxygen-meter, breathing apparatus, life line and whistles are to be at hand during the survey. When boats or rafts are used, appropriate life jackets are to be available for all persons on board.

Boats or rafts are to have satisfactory residual buoyancy and stability even if one chamber is ruptured.

A safety check-list is to be provided.

**1/B.5.5.4** Surveys of tanks by means of boats or rafts may only be undertaken with the agreement of the Surveyor, who is to take into account the safety arrangements provided, including weather forecasting and ship response in reasonable sea conditions.

#### 1/B.6 Documentation on Board

# 1/B.6.1 General

**1/B.6.1.1** The Owner is to supply and maintain on board documentation as specified in 1/B.6.2 and 1/B.6.3, which should be readily available for the Surveyor.

**1/B.6.1.2** The documentation is to be kept on board for the lifetime of the ship.

### 1/B.6.2 Survey Report File

**1/B.6.2.1** A Survey Report File is to be a part of the documentation on board consisting of:

- a) Reports of structural surveys,
- b) Condition Evaluation Report,
- c) Thickness measurement reports,
- d) Survey plan as noted in 1/B.5.1 until such time as the Special Survey has been completed.

**1/B.6.2.2** The Survey Report File is also to be available in the Owner's management office.

#### 1/B.6.3 Supporting Documents

**1/B.6.3.1** The following additional documentation is to be available on board:

- a) Main structural plans of cargo and ballast tanks
- b) Previous repair history
- c) Cargo and ballast history
- d) Extent of use of inert gas plant and tank cleaning procedures
- e) Inspections and actions taken by ship's personnel with reference to
  - i structural deterioration in general
  - ii leakage in bulkheads and piping
  - iii condition of coating or corrosion protection, if any. A guidance for reporting is shown in Table 1/B.5.
- any other information that will help to identify critical structural areas and/or suspect areas requiring inspection.

### 1/B.7. Procedures for Thickness Measurements

#### 1/B.7.1 General

1/B.7.1.1 Thickness measurements are to be carried out under the guidance of the Surveyor. Consideration may be given in special circumstances to accepting thickness measurements taken where a Surveyor was not in attendance.

# 1/B.7.2 Certification of Thickness Measurement Company

1/B.7.2.1 The thickness measurements are to be carried out by a qualified company certified by the Bureau according to principles stated in Table 1/B.7.

### 1/B.7.3 Reporting

1/B.7.3.1 A thickness measurement report is to be prepared and submitted to the attending Surveyor. The report is to give the location of measurements, the thickness measured as well as corresponding original thickness. Furthermore, the report is to give the date when the measurements were carried out, type of measuring equipment, names of personnel and their qualifications and has to be signed by the operator. The thickness measurement report is to follow the principles as specified in Annex 1/B.1, for Thickness Measurements of Oil Tankers, Ore/Oil Ships, etc.

1/B.7.3.2 The Surveyor is to verify and countersign the thickness measurement report.

# 1/B.8 Reporting and Evaluation of Survey

#### 1/B.8.1 Evaluation of Survey Report

**1/B.8.1.1** The data and information on the structural condition of the vessel collected during the survey is to be evaluated for acceptability and continued structural integrity of the vessel.

#### 1/B.8.2 Reporting

1/B.8.2.1 Principles for survey reporting are shown in Table 1/B.8.

**1/B.8.2.2** A Condition Evaluation Report of the survey and results is to be issued to the Owner as shown in Table 1/B.9 and placed on board the vessel for reference at future surveys.

# TABLE 1/B.1 REQUIREMENTS FOR CLOSE-UP SURVEY OF OIL TANKERS, ORE/OIL SHIPS, ETC.

Special Periodical Survey

Number 1

(Age  $\leq$  5 years)

 One complete transverse web frame ring including adjacent structural members in a ballast wing tank, if any, or a cargo wing tank used primarily for water bal-

last. [A]

- 2. One deck transverse including adjacent deck structural members in a cargo wing tank. [B]
- 3. Lower part of transverse bulkhead including girder system and adjacent structural members
  - -in one ballast tank
  - —in one cargo oil wing tank
  - —in one cargo oil center tank [D]

Special Periodical Survey Number 2

 $(5 < Age \le 10 \ years)$ 

- All complete transverse
  web frame rings including
  adjacent structural members in a ballast wing tank,
  if any, or a cargo wing tank
  used primarily for water ballast. [A]
- 2. One deck transverse including adjacent deck structural members
  - in each of the remaining ballast tanks, if any
  - in a cargo wing tank
  - in two cargo center tanks [B]
- 3. Both transverse bulkheads including girder system and adjacent structural members in a wing ballast tank, if any, or a cargo wing tank used primarily for water ballast. [C]
- 4. Lower part of transverse bulkhead including girder system and adjacent struc
  - tural members

     in each remaining ballast tank
  - in one cargo oil wing tank
  - in two cargo center tanks [D]

Special Periodical Survey Number 3

 $(10 < Age \le 15 \ years)$ 

- All complete transverse web frame rings including adjacent structural members
  - —in all ballast tanks
  - —in a cargo wing tank [A]
- 2. One complete transverse web frame ring including adjacent structural members in each remaining cargo wing tank. [A]
- 3. One deck and bottom transverse including adjacent structural members in each cargo center tank. [E]
- 4. All transverse bulkheads including girder and stiffener systems and adjacent members in all cargo and ballast tanks. [C]
- 5. Additional complete transverse web frame rings as considered necessary by the Surveyor. [F]
- 5. Additional complete trans-

verse web frame rings as

considered necessary by

the Surveyor. [F]

6. Any additional tanks and structure as considered necessary by the Surveyor.

- NOTE
- 1. With reference to cargo and ballasting history and coating arrangements, tanks and holds should be selected for Close-up Surveys which will provide the best representative sampling of areas likely to be most exposed to the effects of corrosion, swash or stress concentrations
- 2. Close-up Surveys are to include welded attachments.
- 3. Refer to figures in Annex 1/B.1.
  - [A] Complete transverse web frame ring including adjacent structural members.
  - [B] Deck transverse including adjacent deck structural members.
  - [C] Transverse bulkhead complete including girder system and adjacent members.
  - [D] Transverse bulkhead lower part including girder system and adjacent structural members.
  - [E] Deck and bottom transverse including adjacent structural members.
  - [F] Additional complete transverse web frame rings.

# Subsequent Special Periodical Surveys

(Age > 15 years)

- All complete transverse web frame rings including adjacent structural members
  - —in all ballast tanks
  - —in a cargo wing tank [A]
- 2. One complete transverse web frame ring including adjacent structural members in each remaining cargo wing tank. [A]
- 3. One deck and bottom transverse including adjacent structural members in each cargo center tank. [E]

4. All transverse bulkheads in-

cluding girder and stiffener

systems and adjacent mem-

bers in all cargo and ballast

tanks. [C]

TABLE 1/B.2 Requirements for Thickness Measurements at Special Survey of Oil Tankers, Ore/Oil Ships, Etc.

Jilips, Lic.						
Special Periodio Number		Special Periodical Survey Number 2		Special Periodical Survey Number 3	St	ubsequent Special Periodical Surveys
$(Age \le 5 \ y)$	years)	$(5 < Age \le 10 \ years)$		$(10 < Age \le 15 \ years)$		(Age > 15 years)
1. One transverse deck plating for beam of the sh amidships 0.5L ballast tank, if a cargo tank used for water ballas	r the full ip within (in way of a any, or a 1. l primarily	All main deck plating within the amidships 0.5L or cargo area, whichever is longer.	(	All main deck plating within the amidships 0.5L or cargo area whichever is longer.	1.	All main deck plating within the cargo area, all exposed main deck plating outside of cargo area, and all exposed 1st tier superstructure deck plating (poop, bridge and forecastle decks).
2. Measurement, assessment and of corrosion pa structural mem to Close-up Su	recording tterns, of bers subject 2.	One transverse section within the amidships 0.5L.		Two transverse sections within the amidships 0.5L.	2.	A minimum of three transverse sections within the amidships 0.5L.
3. Suspect areas the vessel.	hroughout 3.	Plating in two wind-and-water strakes outside the amidships 0.5L.		All plating in two wind- and-water strakes, port and starboard, full length.	3.	All plating in two wind- and-water strakes, port and starboard, full length.
	4.	Plating and stiffeners of transverse bulkheads and in- ternals in forepeak and afterpeak tanks.	t t	Plating and stiffeners of transverse bulkheads and in- ternals in forepeak and afterpeak tanks.	4.	Plating and stiffeners of transverse bulkheads and in- ternals in forepeak and afterpeak tanks.
	5.	Measurement, for general assessment and recording of corrosion patterns, of structural members subject to Close-up Surveys.	6	Measurement, for general assessment and recording of corrosion patterns, of structural members subject to Close-up Surveys.	5.	All keel and bottom plating full length.
	6.	Suspect areas throughout the vessel.		Suspect areas throughout the vessel.	6.	Measurement, for general assessment and recording of corrosion patterns, of structural members subject to Close-up Surveys.
					7.	Suspect areas throughout vessel.

- 1 Definition of transverse section (girth belt/belt). A transverse section includes all longitudinal members such as plating, longitudinals and girders at the deck, side, bottom, inner bottom and longitudinal bulkheads.
- 2 With reference to cargo/ballast history and arrangement and condition of coatings, tanks and specific thickness gauging locations should be selected which will provide the best representative sampling of areas likely to be most exposed to corrosion effects, i.e. typically in way of ballast tanks.
- 3 (1998) As noted in 1/B.2.5.4, where coatings are found in GOOD condition as defined in 1/B.1.2.9, the extent of thickness measurements of structural members in way of Close-up Surveys may be modified by the Surveyor. After Special Survey No. 2, modification of the extent of thickness measurements of structural members subject to Close-up Surveys is to be specially considered.
- 4 As Appendix 1/B requirements address all ballast tanks, Close-up surveys and gauging requirements apply to forepeak and afterpeak tanks allocated for ballast.

# TABLE 1/B.3 Requirements for tank testing at Special Survey of Oil Tankers. Ore/Oil Ships. etc. (see

quireinents	ioi talik	testing at	. Opeciai	Juivey	OI OII	Tallkels,	Ole/Oll	onips, cu
e 1/3.7.1I)								
, 0 1/0.7.11/								

1. All ballast tank boundaries.

 $AGE \le 5 YEARS$ 

- 2. Cargo tank boundaries facing ballast tanks, void spaces, pipe tunnels, fuel oil tanks, pump rooms or cofferdams
- $5 < AGE \le 10 \ YEARS$

1. All ballast tank boundaries.

2. Cargo tank boundaries fac-

ferdams

ing ballast tanks, void

spaces, pipe tunnels, fuel oil

tanks, pump rooms or cof-

3. All cargo tank bulkheads

of segregated cargoes

which form the boundaries

- $10 < AGE \le 15 \ YEARS$
- 2. Cargo tank boundaries facing ballast tanks, void spaces, pipe tunnels, fuel oil tanks, pump rooms or cofferdams

1. All ballast tank boundaries.

- 3. All remaining cargo tank bulkheads
- AGE > 15 YEARS
- 1. All ballast tank boundaries.
- 2. Cargo tank boundaries facing ballast tanks, void spaces, pipe tunnels, fuel oil tanks, pump rooms or cofferdams
- 3. All remaining cargo tank bulkheads

# TABLE 1/B.4a

Requirements for extent of thickness measurement at those areas of substantial corrosion. Special Survey of Oil Tankers, Ore/Oil Ships, etc. within the cargo tank length.

# Bottom Structure

Structural Member	Extent of Measurement	Pattern of Measurement
1. Bottom plating	Minimum of 3 bays across tank, including aft bay. Measurements around and under all bell mouths.	5 point pattern for each panel between longitudinals and webs
2. Bottom Longitudinals	Minimum of 3 longitudinals in each bay where bottom plating measured.	3 measurements in line across flange and 3 measurements on vertically web.
3. Bottom girders and brackets	At fore and aft transverse bulkhead bracket toes and in centre of tanks	Vertical line of single measurements on web plating with one measurement between each panel stiffener, or a minimum of three measurements. Two measurements across face flat. 5 point pattern on girder/bhd brackets.
4. Bottom transverse webs	3 webs in bays where bottom plating measured, with measurements at both ends and middle.	5 points pattern over 2 square metre area. Single measurements on face flat.
5. Panel stiffening	Where available	Single measurements

# TABLE 1/B.4b

Requirements for extent of thickness measurement at those areas of substantial corrosion. Special Survey of Oil Tankers, Ore/Oil Ships, etc. within the cargo tank length.

Structural Member	Extent of Measurement	Pattern of Measurement
1. Deck plating	Two bands across tank	Minimum of three measurements per plate per band
2. Deck Longitudinals	Minimum of 3 longitudinals each in two bays	3 measurements in line vertically on webs, and 2 measurements on flange (if fitted).
3. Deck girders and brackets	At fore and aft transverse bulkhead, bracket toes and in centre of tanks.	Vertical line of single measurements on web plating with one measurement between each panel stiffener, or a minimum of three measurements. Two measurements across face flat. 5 point pattern on girder/bhd brackets.
4. Deck transverse webs	Minimum of two webs with measurements at middle and both ends of span	5 points pattern over 2 square metre areas. Single measurements on face flat.
5. Panel stiffening	Where available	Single measurements

# TABLE 1/B.4c

Requirements for extent of thickness measurement at those areas of substantial corrosion. Special Survey of Oil Tankers, Ore/Oil Ships, etc. within the cargo tank length.

Shell and Longitudinal Bulkheads

Structural Member	Extent of Measurement	Pattern of Measurement
Deckhead and bottom strakes, and strakes in way of stringer platforms	Plating between each pair of longitudinals in a minimum of 3 bays	Single measurement
2. All other strakes	Plating between every 3rd pair of longitudinals in same 3 bays	Single measurement
3. Longitudinals-deckhead and bottom strakes	Each longitudinal in same 3 bays	3 measurements across web and 1 measurement on flange
4. Longitudinals—all others	Every third longitudinal in same 3 bays	3 measurements across web and 1 measurement on flange
5. Longitudinals-bracket	Minimum of three at top middle and bottom of tank in same 3 bays	5 point pattern over area of bracket
6. Web frames and cross ties	3 webs with minimum of three locations on each web, including in way of cross tie connections	5 point pattern over about 2 square metre area, plus single measurements on web frame and cross tie face flats

# TABLE 1/B.4d

Requirements for extent of thickness measurement at those areas of substantial corrosion. Special Survey of Oil Tankers, Ore/Oil Ships, etc. within the cargo tank length.

		Transverse Bulkheads and Swash Bulkheads	
	Structural Member	Extent of Measurement	Pattern of Measurement
1.	Deckhead and bottom strakes, and strakes in way of stringer platforms	Plating between pair of stiffeners at three locations—approx. 1/4, 1/2 and 3/4 width of tank	5 points pattern between stiffeners over 1 metre length
2.	All other strakes	Plating between pair of stiffeners at middle location	Single measurement
3.	Strakes in corrugated bulkheads	Plating for each change of scantling at cen- tre of panel and at flange or fabricated connection	5 point pattern over about 1 square metre of plating
4.	Stiffeners	Minimum of three typical stiffeners	For web, 5 point pattern over span between bracket connections (2 measurements across web at each bracket connection, and one at centre of span). For flange, single measurements at each bracket toe and at centre of span
5.	Brackets	Minimum of three at top, middle and bottom of tank	5 point pattern over area of bracket
6.	Deep webs and girders	Measurements at toe of bracket and at centre of span	For web, 5 point pattern over about 1 square metre. 3 measurements across face flat.
7.	Stringer platforms	All stringers with measurements at both ends and middle	5 point pattern over 1 square metre of area plus single measurements near bracket toes and on face flats

# **TABLE 1/B.5**

Ship Name:	• • • • •				<del></del>	
OW	NERS INSPECT	ION REPORT	- Structi	ıral Condition	ı	
	F	or Tank No	o.:			
Grade of Steel:	Deck Bottom	: :		Side Long. Bhd.	: :	
Elements Cracks Other	Buckles	Corr- osion	Coating cond.	Pitting	Mod. /Rep.	
Deck:				·- · · · · · · · · · · · · · · · · · ·		
Bottom:						
Side:						
Long. Bulkheads:						
Transv. Bulkheads:						
* Repairs carried out due to:						
Thickness measurements carried out, dates: Results in General:						
Overdue Surveys:						
Outstanding Conditions of class:						
Comments:						
*Repairs are to be s	urveyed by a	n ABS Surv	eyor			
Date of Inspection:. Inspected by: Signature:						

# TABLE 1/B.6

No Text

# TABLE 1/B.7

# Procedures for Certification of Firms Engaged in Thickness Measurement of Hull Structures

#### 1. Application

This guidance applies for certification of the firms which intend to engage in the thickness measurement of hull structures of the vessels.

#### 2. Procedures for Certification

(1) Submission of Documents;

The following documents are to be submitted to the Bureau for approval.

- a) Outline of firms, e.g. organization and management structure.
- b) Experience of the firms on thickness measurement inter alia of hull structures of the vessels.
- c) Technicians careers, i.e. experiences of technicians as thickness measurement operators, technical knowledge of hull structure, etc. Operators should be qualified according to a recognized industrial NDT Standard.
- d) Equipment used for thickness measurement such as ultra-sonic testing machines and its maintenance/-calibration procedures.
- e) A guide for thickness measurement operators.
- f) Training programs of technicians for thickness measurement.
- g) Measurement record format in accordance with Annex 1/B.1 Procedures for Thickness Measurements.
- (2) Auditing of the firms;

Upon reviewing the documents submitted with satisfactory results, the firm is audited in order to ascertain that the firm is duly organized and managed in accordance

- with the documents submitted, and eventually is capable of conducting thickness measurement of the hull construction of the ships.
- (3) Certification is conditional on an onboard demonstration of thickness measurement as well as satisfactory reporting.

#### 3. Certification

- (1) Upon satisfactory results of both the audit of the firm in 2(2) and the demonstration tests in 2(3) above, the Bureau will issue a Certificate of Approval as well as a notice to the effect that the thickness measurement operation system of the firm has been certified by the Bureau.
- (2) Kenewal/endorsement of the Certificate is to be made at intervals not exceeding 3 years by verification that original conditions are maintained.

### 4. Information of any alteration to the Certified Thickness Measurement Operation System

In case where any alteration to the certified thickness measurement operation system of the firm is made, such an alteration is to be immediately informed to the Bureau. Re-audit is made where deemed necessary by the Bureau.

#### 5. Cancellation of Approval

Approval may be cancelled in the following cases:

- (1) Where the measurements were improperly carried out or the results were improperly reported.
- (2) Where the Surveyor found any deficiencies in the approved thickness measurement operation systems of the firm.
- (3) Where the firm failed to inform of any alteration in 4 above to the Bureau.

# TABLE 1/B.8 Reporting Principles

In principle, the following items pertaining to tanker structures are to be included in the reporting forms, as applicable for the type of survey:

# 1.0 Type of Survey (Special Survey, Intermediate Survey, Annual Survey, Other)

#### 2.0 Extent of the Survey

- 2.1 Identification of overall surveyed tanks.
- 2.2 The location where in each tank Close-up Survey has been carried out, and means of access.
- 2.3 Identification of tanks and location in tanks where the thickness measurements were carried out.
- 2.4 Identification of pressure tested tanks.

# 3.0 Results of the Survey

- 3.1 Coating condition of each tank (if applicable). Identify tanks with anodes.
- 3.2 Structural condition of each tank:
- 3.2.1 Identify tanks found in satisfactory condition.
- 3.2.2 Identify all conditions found which should be corrected or recorded, such as:
  - a Corrosion:—Structure members
    - -Type of corrosion (Pitting, General)
    - —Extent
  - b Cracks (location)
  - c Buckling (location)
  - d Indents (location)

The narrative reports may be supplemented by sketches/photos of damages/repairs.

3.3 Thickness measurement report endorsed by the attending class Surveyor.

# 4.0 Actions to possible findings:

- 4.1 Repair in identified tanks:
  - a Structural member
  - b Repair method
  - c Repair extent
- 4.2 Recorded findings considered not to necessitate repairs. Memoranda for future inspections and thickness measurements to be given, e.g. for areas found as suspect with respect to corrosion (ref. item 1/B.1.2.6).
- 4.3 Condition of Class (Recommendations)

# TABLE 1/B.9a Condition Evaluation Report

Issued upon Completion of Special Survey

GENERAL PARTICULARS	
SHIPS NAME:	ABS IDENTIFICATION NUMBER:
	IMO IDENTITY NUMBER:
PORT OF REGISTRY:	NATIONAL FLAG:
DEADWEIGHT (M. TONNES):	GROSS TONNAGE:
DATE OF BUILD:	CLASSIFICATION NOTATION:
DATE OF MAJOR CONVERSION:	OWNER
TYPE OF CONVERSION	

- a) The survey reports and documents listed below have been reviewed by the undersigned and found to be satisfactory.
- b) A Summary of the survey is attached herewith on sheet 2.
- c) The hull special survey as been completed in accordance with the Regulations on [date].

Condition Evaluation Report completed by:	<u>Name</u> Signature	<u>Title</u>
OFFICE	DATE	
Condition Evaluation Report verified by:	<u>Name</u> Signature	<u>Title</u>
OFFICE	DATE	

Attached reports and documents:

- 1)
- 2)
- 3)
- 4)
- 5) 6)

# TABLE 1/B.9b Condition Evaluation Report

A)	General Particulars:	_	Ref. Table 1/B.9a
B)	Report Review:	_	Where and how survey was done
C)	Close-up Survey:	_	Extent (Which tanks)
D)	Thickness measurements:	 	Reference to Thickness Measurement report Summary of where measured Separate form indicating the tanks/areas with Substantial Corrosion, and corresponding  Thickness dimunition  Corrosion pattern
E)	Tank Protection: Separat	te form ind	licating: Location of coating/anodes Condition of coating (as applicable)
F)	Repairs:	_	Identification of tanks/areas
G)	Condition of Class/Recomm	mendation	S:
H)	Memoranda:		Items noted for record Any points of attention for future surveys, e.g. for Suspect Areas. Extended Annual/Intermediate survey due to coating breakdown
I)	Conclusion:	_	Statement on evaluation/verification of Survey report

# TABLE 1/B.9c **Extract of Thickness Measurements**

Reference is made to the thickness measurements report:

1 Position of substantially corroded Tanks/Areas.	Thickness dimunition [%]	2 Corrosion pattern	Remarks: e.g. Ref. attached sketches

# Remarks

1  $\,$  Substantial corrosion, i.e. 75–100% of acceptable margins wasted

2 P = Pitting C = Corrosion in General

# TABLE 1/B.9d **Tank Protection**

1	2	3	
Tank Nos.	Tank protection	Coating condition	Remarks

# Remarks

- 1 All segregated ballast tanks and combined cargo/ballast tanks to be listed.
- 2 C = Coating A = Anodes NP = No Protection 3 Coating condition according to the following standard.

condition with only minor spot rusting. GOOD

**FAIR** condition with local breakdown at edges of stiffeners and weld connections and/or light rusting over 20% or more of areas under consideration, but less than as defined for POOR condition.

**POOR** condition with general breakdown of coating over 20% or more of areas or hard scale at 10% or more of areas under consideration.

If coating condition "POOR" is given, extended annual surveys are to be introduced. This is to be noted in part H) of the Condition Evaluation Report in Table 1/B.9b.

TABLE 1/B.10 (1998)

Overall Survey, Close-up Survey and Thickness Measurement Requirements at Intermediate Survey of Oil Tankers, Ore/oil Ships, Etc.

$5 < AGE \le 10$	$10 < AGE \le 15$	AGE > 15
Overall Survey <sup>1</sup> of at least three (3) representative ballast tanks selected by the Surveyor.  Where no protective coating is applied; where protective coating is in POOR condition; or where corrosion or other defects are found; the Overall Survey is to be extended to other ballast tanks of the same type.	Overall Survey <sup>1</sup> of all ballast tanks and combined cargo/ballast tanks.	Overall Survey <sup>1</sup> of all ballast and combined cargo/ballast tanks.
	Close-up Survey <sup>2,3</sup> of ballast tanks per requirements of previous Special Survey.	Close-up Survey <sup>2,3</sup> of ballast tanks per requirements of previous Special Survey.
	Overall Survey of at least three (3) representative cargo tanks.	Overall Survey of at least three (3) representative cargo tanks.
	Close-up Survey <sup>2,3</sup> of at least two (2) combined cargo/ballast tanks to the extent considered necessary based on record of previous Special Survey and repair history.	Close-up Survey <sup>2,3</sup> of at least two (2) combined cargo/ballast tanks to the extent considered necessary based on record of previous Special Survey and repair history.
		Close-up Survey <sup>2,3</sup> of at least one (1) additional cargo tank to the extent considered necessary based on record of previous Special Survey and repair history.
Thickness measurements of suspect areas, as defined by 1/B.1.2.6, identified at previous Special Survey.	Thickness measurements of suspect areas, as defined by 1/B.1.2.6, identified at previous Special Survey.	Thickness measurements of suspect areas, as defined by 1/B.1.2.6, identified at previous Special Survey.
Where substantial corrosion, as defined by 1/B.1.2.7 is found, additional thickness measurements in accordance with Table 1/B.4.	Where substantial corrosion, as defined by 1/B.1.2.7 is found, additional thickness measurements in accordance with Table 1/B.4.	Where substantial corrosion, as defined by 1/B.1.2.7 is found, additional thickness measurements in accordance with Table 1/B.4.
Thickness measurements as considered necessary by the Surveyor.	Thickness measurements as considered necessary by the Surveyor.	Thickness measurements as considered necessary by the Surveyor.

<sup>1</sup> If no visible structural defects are found, the examination may be limited to a verification that the protective coating remains effective.

<sup>2</sup> For areas in tanks (ballast, cargo or combined ballast/cargo) where coatings are found in GOOD condition as defined in 1/B.2.9, the extent of Close-up Survey may be specially considered.

<sup>3</sup> The extent of Close-up Surveys may be extended as stated in 1/B.2.4.3.

Appendix 1/B annex 1/B.1 Procedures for Thickness Measurements of Oil Tankers, Ore/Oil Ships, Etc.

#### **Contents**

Sheet 1	_	Contents
Sheet 2	_	Instructions
Sheet 3	_	General particulars

#### REPORTS

Sheet 4	_	Report	TM1-T	for	recording	the	thickness	measure	ement	of al	l deck	plating,	all	bottom	shell	plating	and si	de sh	ıell
		plating.																	

- Sheet 5 Report TM2-T (i) for recording the thickness measurement of shell and deck plating at transverse sections strength deck and sheerstrake plating.
- Sheet 6 Report TM2-T (ii) for recording the thickness measurement of shell and deck plating at transverse sections shell plating.
- Sheet 7 Report TM3-T for recording the thickness measurement of longitudinal members at transverse sections.
- Sheet 8 Report TM4-T for recording the thickness measurement of transverse structural members.
   Sheet 9 Report TM5-T for recording the thickness measurement of W.T./O.T. transverse bulkheads.
   Sheet 10 Report TM6-T for recording the thickness measurement of miscellaneous structural members.

#### GUIDANCE

- Sheet 11 Oil tanker typical transverse sections. The diagram includes details of the items to be measured and the report forms to be used
- Sheet 12 Ore/Oil ship typical transverse section. The diagram includes details of the items to be measured and the report forms to be used.
- Sheet 13 Transverse section outline. This diagram may be used for those ships where the diagrams on sheet 11 and sheet 12 are not suitable.
- Sheet 14 Oil tanker and Ore/Oil Ship, diagrams showing the typical longitudinal members in a transverse section.
- Sheet 15 Transverse sections of oil tankers and ore/oil ships showing typical areas for thickness measurement in association with close-up survey requirements.

#### ANNEX 1/B.1

### Procedures for Thickness Measurements of Oil Tankers, Ore/Oil Ships, Etc.

#### **INSTRUCTIONS**

- 1. This document is to be used for recording thickness measurements as required by Table 1/B.2 and 1/B.4 of the Appendix 1/B.
- 2. Reporting forms TM1-1, TM2-T, TM3-6, TM4-T, TM5-T and TM6-7 (Sheets 4–10) are to be used for recording thickness measurements.
- 3. The remaining Sheets 11–15 are guidance diagrams and notes relating to the reporting forms and the procedure for thickness measurements.
- 4. The reporting forms should, where appropriate, be supplemented by data presented on structural sketches.

#### **General Particulars**

Ships name:-			
IMO number			
ABS identification number			
Port of registry:-			
Gross tons:-			
Deadweight:-			
Date of build:-			
Classification society:-			
Name of Company performing thickness measurement:-			
Thickness measurement company certified by:-			
Certificate No.			
Certificate valid from to			
Place of measurement			
First date of measurement:-			
Last date of measurement:-			
Special survey/intermediate survey due:-*			
Details of measurement equipment:-			
Qualification of operator:-			
Report Number:-		consisting of	Sheets
Name of operator:-	Name of surveyor:-		
Signature of operator:-	Signature of surveyor:-		
Company official stamp:-	Classification Society		
-	Official Stamp:-		

<sup>\*</sup>Delete as appropriate.

NOTES - See Reverse

Surveyors Signature .....

Report on THICKNESS MEASUREMENT of ALL DECK PLATING, ALL BOTTOM SHELL PLATING or SIDE SHELL PLATING\*

( \*— delete as appropriate)

TM1-T

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		ş	5	letter																								
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Operators Signature ...

- 1. This report is to be used for recording the thickness measurement of:-
  - A- All strength deck plating within the cargo area.
  - B- All keel, bottom shell plating and bilge plating within the cargo area.
  - C- Side shell plating including selected wind and water strakes outside 0.5L amidships.
- 2. The strake position is to be clearly indicated as follows:
  - 2.1 For strength deck indicate the number of the strake of plating inboard from the stringer plate.
  - 2.2 For bottom plating indicate the number of the strake of plating outboard from the keel plate.
  - 2.3 For side shell plating give number of the strake of plating below sheerstrake and letter as shown on shell expansion.
- 3. For oil tankers all deck plating strakes are to be recorded, for ore/oil ships only the deck plating strakes outside line of openings are to be recorded.
- 4. Measurements are to be taken at the forward and aft areas of all plates and where plates cross ballast/ cargo tank boundaries separate measurements for the area of plating in way of each type of tank are to be recorded.
- 5. The single measurements recorded are to represent the average of multiple measurements.

NOTES - See Reverse

Surveyors Signature .....

Report on THICKNESS MEASUREMENT OF SHELL AND DECK PLATING (one, two or three transverse sections)

Report No.	
Class Identity No.	
Ship's Name	

						"	TREN	GTHI	EÇ.	AND	SHEE	STRENGTH DECK AND SHEERSTRAKE PLATING	AKE	PLAT	<u>N</u> G									
		<del>E</del>	3ST TR	ANSVE	FIRST TRANSVERSE AT FRAME NUMBER	T FRAM	ا ا		SE	COND	TRANS	SECOND TRANSVERSE SECTION AT FRAME NUMBER	SECTI	ON AT	FRAME	H	F	IRO TR	THIRD TRANSVERSE SECTION AT FRAME NUMBER	ASE SE JUMBE	CTION	AT FR/	∖ME	
STRAKE	Š. p	Org	Gauged	ged	Diminution P	utlon	Diminution S		S	Org.	Gauged		Diminution P		Diminution S	<b></b>	No.	Org.	Gauged		Diminution P		Diminution S	ua
POSITION	Letter	Thk.	Р	s	mm	%	mm	<b>Т</b>	Letter	Thk.	а	S	mm	%	mm	الا %	-	¥ ¥	Ь	S	mm m	m %	% mm	%
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Sheet 5

Operators Signature ....

TM2-T (I)

1. This report form is to be used for recording the thickness measurement of:

Strength deck plating and sheerstrake plating transverse sections:

One, two or three sections within the cargo area comprising of the structural items (1), (2) and (3) as shown on the diagrams of typical transverse sections.

- 2. For oil tankers all deck plating strakes are to be recorded and for ore/oil ships only the deck plating strakes outside the line of openings are to be recorded.
- 3. The topside area comprises deck plating, stringer plate and sheerstrake (including rounded gunwales).
- 4. The exact frame station of measurement is to be stated.
- 5. The single measurements recorded are to represent the average of multiple measurements.

NOTES - See Reverse

Surveyors Signature

Operators Signature ....

Report on THICKNESS MEASUREMENT OF SHELL AND DECK PLATING (one, two or three transverse sections)

TM2-T (II)

Report No. ... Class Identity No. Ship's Name

FIRST TRANSVERSE SECTION AT FRAME   FIRST TRANSVERSE SECTION AT											SHE	SHELL PLATING	ATIN	<b>U</b>											
STRAKE         No. Org. Gauged         Domination of the control of th	-		世	ST TR	ANS	VERSE NUN	SECTI	ON AT	FRAM	ш	SECO	ND TRA	NSVE	RSE SE UMBEF	CTION	AT FR	AME	푸	пр тв	ANSVI	ERSE (	SECTION SER	ON AT	FRAN	ш
POSITION LANGE LANGE NAME OF S AND S, And S, Ledge NAME OF S AND S, AND S, Ledge NAME OF S AND S, AND	-	STRAKE	9	Org.	Gau	ged	Dimin.	-	Diminuti		o F	b 3	auged		inution P	Dimin	ution	No.	Org.	Gaug	pel	Diminu P	$\vdash$	Diminu S	tion
				m K.	٩	S	m m	$\vdash$	Н			L.,	H	mm	%	E	%	Letter		۵	П	m m	$\vdash$	E E	%
		1st below sheer strake																							
		2nd																							
		3rd																							
		4th																		-					
		Sth																							
		6th																							
		7th																							
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1. This report is to be used for recording the thickness measurements of:-

Shell plating transverse sections:-

One, two or three sections within the cargo area comprising of the structural items (4), (5), (6) and (7) as shown on the diagrams of typical transverse sections.

- 2. The bottom area comprises keel, bottom and bilge plating.
- 3. The exact frame station of measurement is to be stated.
- 4. The single measurements recorded are to represent the average of multiple measurements.

Report on THICKNESS MEASUREMENT OF LONGITUDINAL MEMBERS (one, two or three transverse sections)

		Œ	RST TF	FIRST TRANSVERSE NUMBER		AT FRAME	ш		S	COND	TRAN	SVERSI	SECT BER	ION AT	SECOND TRANSVERSE SECTION AT FRAME NUMBER		F	THIRD TRANSVERSE SECTION AT FRAME NUMBER	ANSV	ERSE S NUMB	ER	ATF	AME
STRUCTURAL	Item	Org.	Gau	Gauged	Diminution P	utlon	Diminution S		ltem	Org.	Gauged	pef	Diminution P	ution	Diminution S		Item	Org.	Gauged	pa	Diminution P		Diminution S
MEMBER	O	ı. E	۵	S	шш	%	E	%	<u> </u>	3	Ь	S	mm	%	mm	%	_	¥   ¥	۵	S	E E	%	шш
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TM3-T

1. This report is to be used for recording the thickness measurement of:-

Longitudinal Members at transverse sections:-

One, two or three sections within the cargo area comprising of the appropriate structural items (8) to (20) as shown on the diagrams of typical transverse sections.

- 2. The exact frame station of measurement is to be stated.
- 3. The single measurements recorded are to represent the average of multiple measurements.

	IM4-1 INCANESS INCANESS IN THE CARGO OIL	In the cargo oil and water ballast tanks within the cargo tank length	hin the carg	to tank len	gth	<b>0</b> I			
	Ship's Name Clas	Class Identity No				Report No			
	TANK DESCRIPTION:								
	LOCATION OF STRUCTURE:								
	STRUCTURAL MEMBER	ITEM	Original Thickness	Gauged	þəf	Dimin	Diminution P	Dimin	Diminution S
			æ	ď	S	шш	%	mm	%
9									
he									
at Ω							,		
	Oneratore Signature	Surveyors	Surveyore Signature					NOTES - See Bover	Pove Bove

- 1. This report is to be used for recording the thickness measurement of transverse structural members, comprising of the appropriate structural items (25) to (33) as shown on diagrams of typical transverse section.
- 2. Guidance for areas of measurement is indicated on sheet 15 of this document.
- 3. The single measurements recorded are to represent the average of multiple measurements.

Report on THICKNESS MEASUREMENT OF W.T./O.T. TRANSVERSE BULKHEADS within the cargo tank or cargo hold spaces

TM5-T

TANK/HOLD DESCRIPTION:							
LOCATION OF STRUCTURE:			FRAME No. :	No. :			
STRUCTURAL COMPONENT (PLATING/STIFFENER)	Original Thickness		Gauged	Dimir 	Diminution P	Diminution S	ution
	mm	Port	Starboard	mm	%	mm	%
	i.						
	· · · · · ·						

ABS® Rules for Building and Classing Steel Vessels 1998-1999

- 1. This report form is to be used for recording the thickness measurement of W.T./O.T. transverse bulkheads.
- 2. Guidance for areas of measurement is indicated on sheet 15 of this document.
- 3. The single measurements recorded are to represent the average of multiple measurements.

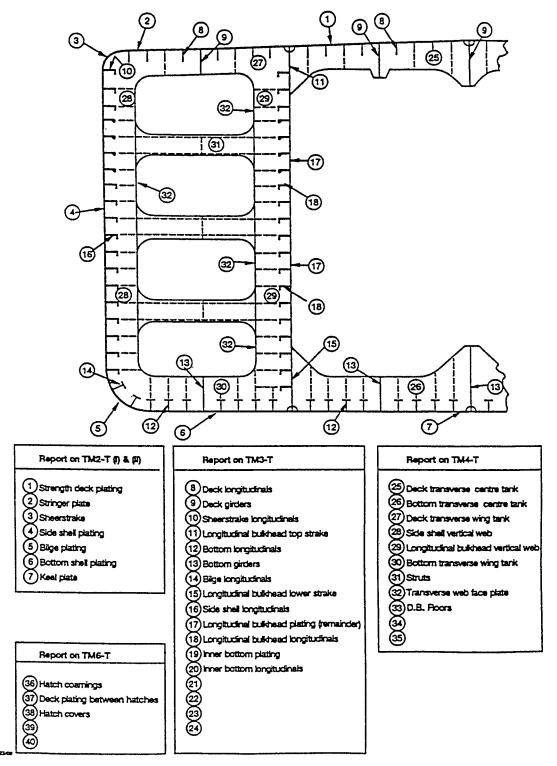
NOTES - See Reverse SKETCH Report No. ..... Report on THICKNESS MEASUREMENT OF MISCELLANEOUS MEMBERS Surveyors Signature ..... Diminution S mm Class Identity No. S Gauged org. Trk Description LOCATION OF STRUCTURE: STRUCTURAL MEMBER: Operators Signature ..... Ship's Name TM6-T Sheet 10

ABS® Rules for Building and Classing Steel Vessels 1998-1999

- 1. This report is to be used for recording the thickness measurement of miscellaneous structural members including the structural items (36), (37) and (38).
- 2. The single measurements recorded are to represent the average of multiple measurements.

#### Thickness Measurement - Oil Tankers, Ore/Oil Ships, etc.

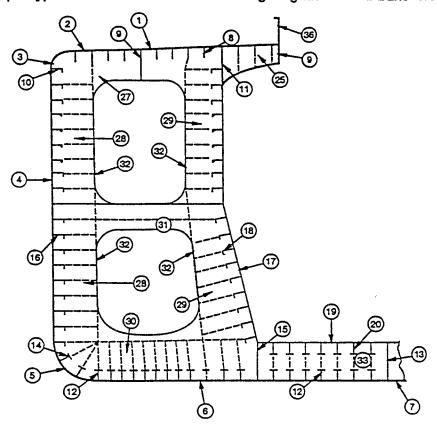
Oil tanker - Typical transverse section indicating longitudinal and transverse members



Sheet 11

#### Thickness Measurement - Oil Tankers, Ore/Oil Ships, etc.

Ore/Oil Ship - Typical transverse section indicating longitudinal and transverse members



## Report on TM2-T (f) & (ii) 1 Strength deck platting 2 Stringer plate 3 Sheerstrake 4 Side shell platting 5 Bilge plating 6 Bottom shell platting 7 Keel plate

Report on	TM6-T
36) Hatch coan 37) Deck platin 38) Hatch cove 39	g between hatches

# B Deck longitudinals Deck girders Deck girders Deck girders Deck girders Longitudinal buildhead top strake Bottom longitudinals Bottom girders Blige longitudinals Longitudinal buildhead lower strake Side shell longitudinals Longitudinal buildhead lower strake Longitudinal buildhead lower strake In Longitudinal buildhead longitudinals Inner bottom plating Inner bottom plating Inner bottom longitudinals Inner bottom longitudinals Inner bottom longitudinals

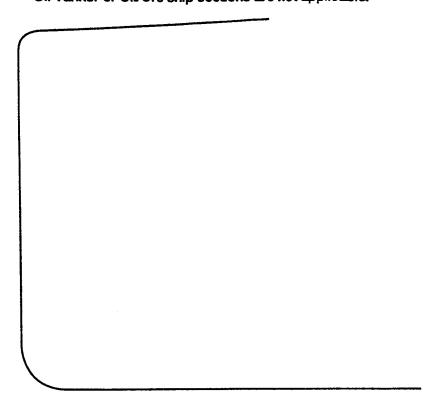
Report on TM3-T.

25 Deck transverse centre tank 26 Bottom transverse centre tank 27 Deck transverse wing tank 28 Side shell vertical web 29 Longitudinal bukhead vertical web 30 Bottom transverse wing tank 31 Struts 32 Transverse web face plate 33 D.B. Floors 34

#### Thickness Measurement - Oil Tankers, Ore/Oil Ships, etc.

Transverse section outline.

To be used for longitudinal and transverse members where typical
Oil Tanker or Oil/Ore ship sections are not applicable.



Report on TM2-T (f) & (ii)
1 Strength deck plating 2 Stringer plate 3 Sheerstrake 4 Side shell plating 5 Bige plating 6 Bottom shell plating 7 Keel plate.

36 Hatch coarnings	Report on TM6-T
33) Hatch covers 39 40	37 Deck plating between hatches

# 8 Deck longitudinals 9 Deck girders 10 Sheerstrake longitudinals 11 Longitudinal bulkhead top strake 12 Bottom longitudinals 13 Bottom girders 14 Bilge longitudinals 15 Longitudinal bulkhead lower strake 16 Side shell longitudinals 17 Longitudinal bulkhead longitudinals 19 Inner bottom platting 20 Inner bottom longitudinals 21 22 23 24

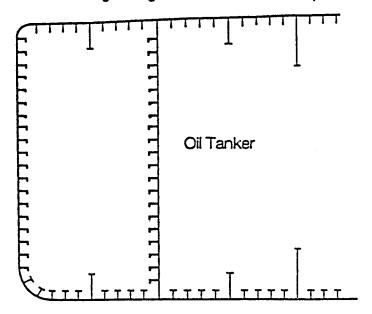
Report on TM4-T
25) Deck transverse centre tank 26) Bottom transverse centre tank 27) Deck transverse wing tank 28) Side shel vertical web 29) Longitudinal buildhead vertical web 30) Bottom transverse wing tank 31) Struts 32) Transverse web face plate 33) D.B. Floors 34)

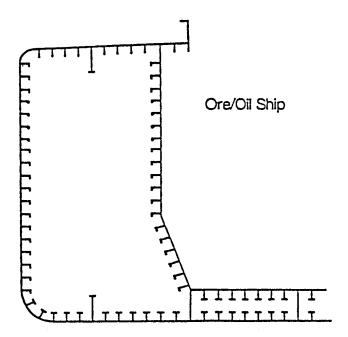
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Sheet 13

#### Thickness Measurement - Oil Tankers, Ore/Oil Ships, etc.

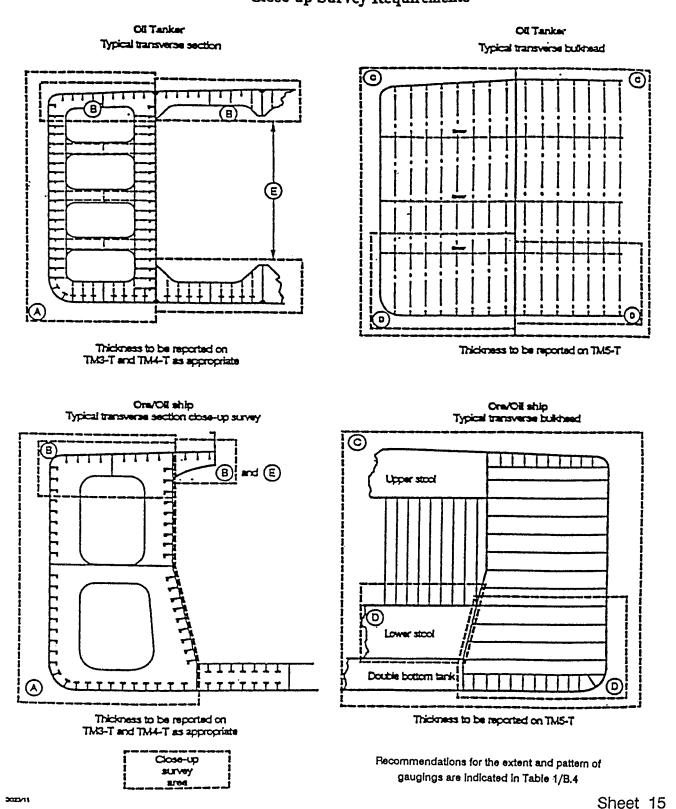
Typical transverse sections showing all longitudinal members to be reported on TM2-T and TM3-T





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### Thickness Measurement - Oil Tankers, Ore/Oil Ships, etc. Close-up Survey Requirements



Appendix 1/B annex 1/B.2 Guidelines for Technical Assessment in Conjunction with Planning for Enhanced Surveys of Oil Tankers Special Survey-Hull

#### **Contents:**

- 1. Introduction
- 2. Purpose and Principles
  - 2.1 Purpose
  - 2.2 Minimum Requirements
  - 2.3 Timing
  - 2.4 Aspects to be Considered
- 3. TECHNICAL ASSESSMENT
  - 3.1 General
  - 3.2 Methods
  - 3.2.1 Design Details
  - 3.2.2 Corrosion
  - $3.2.3\quad Locations \ for \ Close-up \ Survey \ and \ Thickness \ Measurement$

#### REFERENCES

#### ANNEX 1/B.2

#### Guidelines for Technical Assessment in Conjunction with Planning for Enhanced Surveys of Oil Tankers Special Survey-Hull

#### 1.0 Introduction

These guidelines contain information and suggestions concerning technical assessments which may be of use in conjunction with the planning of enhanced special surveys of oil tankers. As indicated in 1/B.5.1.5 of Appendix 1/B, "Hull Surveys of Oil Tankers," the guidelines are a recommended tool which may be made mandatory by the Bureau, when considered necessary and appropriate, in conjunction with the preparation of the required Survey Plan.

#### 2.0 Purpose and Principles

#### 2.1 Purpose

The purpose of the technical assessments described in these guidelines is to assist in identifying critical structural areas, nominating suspect areas and in focusing attention on structural elements or areas of structural elements which may be particularly susceptible to, or evidence a history of, wastage or damage. This information may be useful in nominating locations, areas and tanks for thickness measurement, close-up survey and tank testing.

#### 2.2 Minimum Requirements

However, these guidelines may not be used to reduce the requirements pertaining to thickness measurement, close-up survey and tank testing contained in Tables 1/ B.1, 1/B.2 and 1/B.3, respectively, of Appendix 1/B; which are, in all cases, to be complied with as a minimum.

#### 2.3 Timing

As with other aspects of survey planning, the technical assessments described in these guidelines should be worked out by the Owner or operator in cooperation with the Classification Society well in advance of the commencement of the Special Survey, i.e., prior to commencing the survey and normally at least 12 to 15 months before the survey's completion due date.

#### 2.4 Aspects to be Considered

Technical assessments, which may include quantitative or qualitative evaluation of relative risks of possible deterioration, of the following aspects of a particular ship may be used as a basis for the nomination of tanks and areas for survey:

- Design features such as stress levels on various structural elements, design details and extent of use of high tensile steel.
- Former history with respect to corrosion, cracking, buckling, indents and repairs for the particular ship as well as similar vessels, where available.

• Information with respect to types of cargo carried, use of different tanks for cargo/ballast, protection of tanks and conditions of coating, if any.

Technical assessments of the relative risks of susceptibility to damages or deterioration of various structural elements and areas should be judged and decided on the basis of recognized principles and practices, such as may be found in publications of the Tanker Structure Cooperative Forum (TSCF), (Refs. 2 and 3).

#### 3.0 Technical Assessment

#### 3.1 General

There are three basic types of possible failure which may be the subject of technical assessment in connection with planning of surveys; corrosion, cracks and buckling. Contact damages are not normally covered by the survey plan since indents are usually noted in survey reports and assumed to be dealt with as a normal routine by Surveyors.

Technical assessments performed in conjunction with the survey planning process, should in principle be carried out as shown schematically in Figure 1. The approach is based on an evaluation of experience and knowledge basically related to:

- Design
- Corrosion

The design should be considered with respect to structural details which may be susceptible to buckling or cracking as a result of vibration, high stress levels or fatigue.

Corrosion is related to the ageing process, and is closely connected with the quality of corrosion protection of newbuilding, and subsequent maintenance during the service life. Corrosion may also lead to cracking and/or buckling.

#### 3.2 Methods

#### 3.2.1 Design Details

Damage experience related to the ship in question and similar ships, where available, is the main source of information to be used in the process of planning. In addition, a selection of structural details from the design drawings should be included.

Typical damage experience to be considered will consist of:

- Number, extent, location and frequency of cracks.
- Location of buckles.

This information may be found in the survey reports and/or the Owner's files, including the results of the Own-

er's own inspections. The defects should be analyzed, noted and marked on sketches.

In addition, general experience should be utilized. For example, reference should be made to TSCF's "Guidance Manual for the Inspection and Condition Assessment of Tanker Structures," (Ref. 2), which contains a catalogue of typical damages and proposed repair methods for various tanker structural details.

Such figures should be used together with a review of the main drawings, in order to compare with the actual structure and search for similar details which may be susceptible to damage. An example is shown in Figure 2.

The review of the main structural drawings, in addition to using the above mentioned figures, should include checking for typical design details where cracking has been experienced. The factors contributing to damage should be carefully considered.

The use of high tensile steel (HTS) is an important factor. Details showing good service experience where ordinary, mild steel has been used may be more susceptible to damage when HTS, and its higher associated stresses, are utilized. There is extensive and, in general, good experience, with the use of HTS for longitudinal material in deck and bottom structures. Experience in other locations, where the dynamic stresses may be higher, is less favorable, e.g. side structures.

In this respect, stress calculations of typical and important components and details, in accordance with the latest Rules or other relevant methods, may prove useful and should be considered.

The selected areas of the structure identified during this process should be recorded and marked on the structural drawings to be included in the Survey Plan.

#### 3.2.2 Corrosion

In order to evaluate relative corrosion risks, the following information is generally to be considered.

- Usage of Tanks and Spaces
- Condition of Coatings

- Condition of Anodes
- Cleaning Procedures
- Previous Corrosion Damage
- Ballast use and time for Cargo Tanks
- Corrosion Risk Scheme (See Ref. 3, Table 3.1)
- Location of Heated Tanks

Ref. 3 gives definitive examples which can be used for judging and describing coating condition, using typical pictures of conditions.

The evaluation of corrosion risks should be based on information in Ref. 3, together with relevant information on the age of the ship and the anticipated condition of the ship as derived from the information collected in order to prepare the Survey Plan.

The various tanks and spaces should be listed with the corrosion risks nominated accordingly.

#### 3.2.3 Locations for Close-up Survey and Thickness Measurement

On the basis of the table of corrosion risks and the evaluation of design experience, the locations for initial close-up survey and thickness measurement (sections) may be nominated.

The sections subject to thickness measurement should normally be nominated in tanks and spaces where corrosion risk is judged to be the highest.

The selection of tanks and spaces for close-up survey should, initially, be based on highest corrosion risk, and should always include ballast tanks. The principle for the selection should be that the extent is increased by age or where information is insufficient or unreliable.

#### References

- 1. IACS Unified Requirements Z10.1, "Hull Surveys of Oil Tankers"
- TSCF, "Guidance Manual for the Inspection and Condition Assessment of Tanker Structures."
- 3. TSCF, "Condition Evaluation and Maintenance of Tanker Structures."

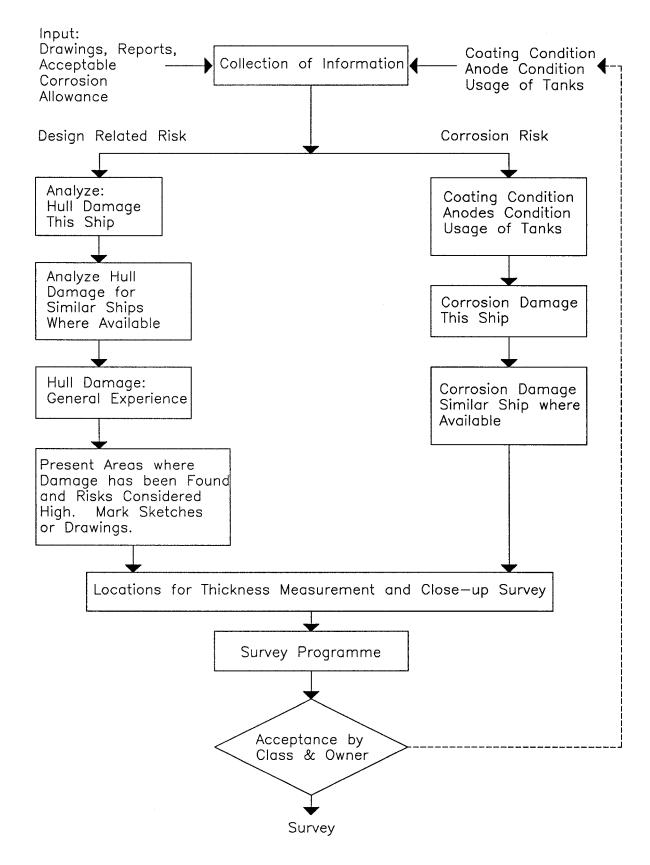


FIGURE 1: TECHNICAL ASSESSMENT AND THE SURVEY PLANNING PROCESS

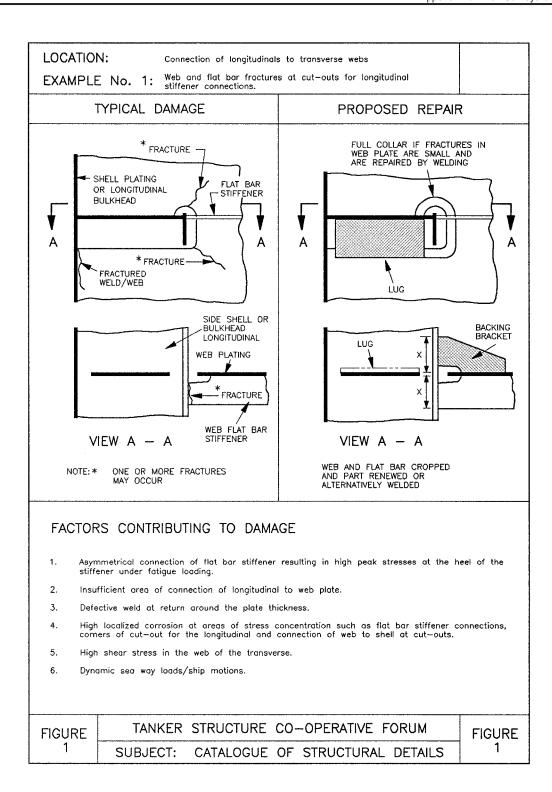


FIGURE 2: TYPICAL DAMAGE AND REPAIR EXAMPLE (REPRODUCED FROM REF. 2)

#### Part 1 Appendix 1/C Hull Surveys of Bulk Carriers

#### **Foreword**

IMO Resolution 713(17) adopted by the Assembly on 6 November 1991 requests the International Association of Classification Societies (IACS) to develop survey and maintenance requirements for bulk carriers as soon as possible.

IACS in turn developed unified requirements UR Z10.2 Hull Surveys of Bulk Carriers which were submitted to IMO for their review in association with development of their guidelines in implementing these IMO requirements, during MSC61 meeting 7–11 December 1992 and during MSC62 in May 1993.

IMO Resolution A.744(18), "Guidelines on the Enhanced Programme of Inspections During Surveys of Bulk Carriers and Oil Tankers", was adopted on 4 November 1993. This Appendix, originally implemented on 1 July 1993, incorporated IMO Absolution A.744(18) as appropriate.

IACS reviewed UR Z10.2 during 1996 and introduced new provisions to tighten and extend its Enhanced Survey Program for bulk carriers which were incorporated into this Appendix effective 1 September 1996.

It should be noted that this Appendix is in addition to the requirements in other parts of the Rules including those in Part 1 Section 3—"Surveys after Construction".

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# Part 1 APPENDIX 1/C Hull Surveys of Bulk Carriers

#### 1/C.1. General

1/C.1.1 Application

**1/C.1.1.1** These requirements apply to hull surveys after construction of all self-propelled bulk carriers.

1/C.1.1.2 These requirements apply to surveys of hull structure and piping systems in way of cargo holds, cofferdams, pipe tunnels and void spaces within the cargo area and all ballast tanks. These requirements are additional to the requirements elsewhere in the Rules.

**1/C.1.1.3** These requirements contain the extent of examination, thickness measurements and tank testing. The survey will be expanded when substantial corrosion and/or structural defects are found and will include additional Close-up Survey when necessary.

#### 1/C.1.2 Definitions

**1/C.1.2-1** A *Bulk Carrier* is a ship which is constructed generally with single deck, topside tanks and hopper side tanks in cargo spaces, and is intended primarily to carry dry cargo in bulk. It includes a vessel of such type as ore carrier or combination carrier<sup>1</sup>.

1/C.1.2.1 A Ballast Tank is a tank which is being used primarily for salt water ballast.

1/C.1.2.1-1 Spaces are separate compartments including holds and tanks.

1/C.1.2.2 An Overall Survey is a survey intended to report on the overall condition of the hull structure and to determine the extent of additional Close-up Surveys.

1/C.1.2.3 A *Close-up Survey* is a survey where the details of structural components are within the close visual inspection range of the Surveyor, i.e. normally within hand's reach.

**1/C.1.2.4** A *Transverse Section* includes all longitudinal members such as plating, longitudinals and girders at the deck, side, bottom; inner bottom and hopper side, longitudinal bulkhead and of topside tank bottom.

**1/C.1.2.5** Representative Spaces are those which are expected to reflect the condition of other spaces of similar type and service and with similar corrosion prevention systems. When selecting representative spaces account should be taken of the service and repair history onboard and identifiable critical and/or suspect areas.

**1/C.1.2.6** Suspect Areas are locations showing substantial corrosion and/or are considered by the Surveyor to be prone to rid wastage.

1/C.1.2.7 Substantial Corrosion is an extent of corrosion such that assessment of corrosion pattern indicates a wastage in excess of 75% of the allowable margins, but within the acceptable limits.

Note: Wastage allowances may be found in "Guide for Preparation for Special Survey".

<sup>1</sup>For combination carriers additional requirements are specified in Appendix 1/B Hull Surveys of Oil tankers.

1/C.1.2.8 Corrosion Prevention System is normally to be a full hard coating which may or may not be supplemented by anodes. Other coating systems may be considered acceptable as alternatives provided that they are applied in compliance with the manufacturers specification and properly maintained.

Soft Coatings—Where soft coatings have been applied, safe access is to be provided for the Surveyor to verify the effectiveness of the coating and to carry out an assessment of the condition of internal structures which may include spot removal of the coating. When safe access cannot be provided the soft coatings is to be removed.

1/C.1.2.9 Coating Condition is defined as follows:

GOOD condition with only minor spot

FAIR condition with local breakdown at edges of stiffeners and weld connections and/or light rusting over 20% or more of areas under consideration, but less than as defined for POOR condition.

POOR condition with general breakdown of coating over 20% or more of areas or hard scale at 10% or more of areas under consideration.

**1/C.1.2.10** Critical Structural Areas are locations which have been identified from calculations to require monitoring, or from the service history of the subject ship or from similar or sister ships to be sensitive to cracking, buckling or corrosion which would impair the structural integrity of the ship.

1/C.1.2.11 Cargo Area is that part of the ship which includes all cargo holds and adjacent areas including fuel tanks, cofferdams, ballast tanks and void spaces.

#### 1/C.1.3 Scope of Surveys

**1/C.1.3.1** Prior to inspection the Surveyor is to examine the completeness of documentation on board, and its contents as a basis for the survey.

1/C.1.3.2 When an Annual, Intermediate or Special Survey results in the identification of significant corrosion or of significant structural defects which, in the opinion of the Surveyor, will impair the structural integrity of the ship, then remedial action, in consultation with the Bureau should be agreed and implemented before the ship continues in service

1/C.1.3.3 (1998) Notwithstanding 1/C.1.3.2, any frame to shell weldment fracture; any frame to shell detachment; or any damage or excessive wastage in excess of allowable limits to side shell frames, their end attachments, adjacent shell plating, deck structure and deck plating between hatches, watertight bulkheads, hatch covers, or hatch coamings; which affects or may affect the vessel's structural or watertight integrity, is to be promptly and thoroughly repaired.

A Prompt and Thorough Repair is defined as a permanent repair, completed at the time of the survey to the satisfaction of the Surveyor.

For locations where adequate repair facilities are not available, consideration may be given to allow the vessel to proceed directly to a repair facility. This may require discharging the cargo and/or temporary repairs for the intended voyage.

#### 1/C.2. Special Survey

#### 1/C.2.1 General

**1/C.2.1.1** The Special Survey may be commenced at the fourth Annual Survey and be progressed with completion by the fifth anniversary date.

1/C.2.1.2 As part of the preparation for the Special Survey, the thickness measurement and Survey Program should be dealt with in advance of the Special Survey. The thickness measurements taken during or after the fourth Annual Survey will be credited towards the Special Survey. 1/C.2.1.3 The Special Survey is to include, in addition to the requirements of the Annual Survey, examination, tests and checks of sufficient extent to ensure that the hull and related piping are in a satisfactory condition and are fit for its intended purpose for the next five year period subject to proper maintenance and operation and to periodical surveys being carried out at the due dates.

1/C.2.1.4 All cargo holds, ballast tanks, pipe tunnels, cofferdams and void spaces bounding cargo holds, decks and outer hull are to be examined. This examination is to be supplemented by thickness measurement and testing as deemed necessary, to ensure that the structural integrity remains effective. The examination is to be sufficient to discover substantial corrosion, significant deformation, fractures, damages or other structural deterioration.

1/C.2.1.5 All piping systems within the above spaces are to be examined and operationally tested under working conditions to ensure that effectiveness and condition remain satisfactory.

1/C.2.1.6 The survey extent of combined ballast/cargo holds is to be evaluated based on the records of ballast history, extent of the corrosion prevention system provided and extent of corrosion found.

#### 1/C.2.2 Drydock Survey

1/C.2.2.1 A survey in drydock is to be a part of the Special Survey.

#### 1/C.2.3 Tank Protection

1/C.2.3.1 (1998) Where provided, the condition of coating or corrosion prevention system of ballast tanks is to be examined. Tanks used for salt water ballast where a protective coating is found in POOR condition as defined in 1/C.1.2.9 and the owners or their representatives elected not to restore the coating, where soft coating has been applied, or where a protective coating has not been applied are to be internally examined at each subsequent Annual Survey.

Where extensive areas of wastage are found, thickness measurements are to be carried out and renewals made when wastage exceeds allowable margins.

#### 1/C.2.4 Hatch Covers and Coamings

The hatch covers and coamings are to be surveyed as follows:

**1/C.2.4.1** A thorough inspection of the items listed in 1/C.4.3 is to be carried out.

1/C.2.4.2 Confirmation of the effectiveness of sealing arrangements of all hatch covers sealed by gaskets and securing devices by hose testing or equivalent.

1/C.2.4.3 Thickness measurement of hatch cover, coaming and their stiffening members as specified in Table 1/C.2.

#### 1/C.2.5 Extent of Overall and Close-up Survey

1/C.2.5.1 An Overall Survey of all spaces is to be carried out at Special Survey. For fuel oil tanks the necessity for the Overall Survey is to be determined based on the ship's age. 1/C.2.5.2 Each Special Survey is to include a close-up examination of sufficient extent to establish the condition of the shell frames and their end attachment in all cargo holds and the condition of ballast tanks as indicated in

1/C.2.5.3 (1998) For areas in cargo holds where coatings are found in GOOD condition, as defined in 1/C.1.2.9, the extent of Close-up Surveys required by Table 1/C.1 may be specially considered.

#### 1/C.2.6 Extent of Thickness Measurement

Table 1/C.1.

**1/C.2.6.1** The requirements for thickness measurement at Special Survey are given in Table 1/C.2.

1/C.2.6.2 Where substantial corrosion as defined in 1/C.1.2.7 is found, additional thickness measurements are to be carried out in accordance with Table 1/C.8.

**1/C.2.6.3** The Surveyor may require further thickness measurements as deemed necessary.

1/C.2.6.4 (1998) Where coatings are found to be in GOOD condition as defined in 1/C.1.2.9, the extent of thickness measurements of structural members subject to Close-up Surveys required by Table 1/C.2, may be modified by the Surveyor. After Special Survey No. 2, modification of the extent of thickness measurements of structural members subject to Close-up Surveys is to be specially consideration.

1/C.2.6.5 Transverse sections should be chosen from the section where the largest reductions are suspected to occur or are revealed from deck plating measurements.

#### 1/C.2.7 Extent of Tank Testing

1/C.2.7.1 Boundaries of double bottom, deep, ballast and other tanks, including holds adapted for the carriage of salt water ballast, are to be tested with a head of liquid to the top of hatches for ballast/cargo holds or top of air pipes for ballast tanks or fuel oil tanks. See 1/3.7.9.l.

#### 1/C.3 Intermediate Survey (1998)

1/C.3.1 The Intermediate Survey, which includes the items of Table 1/C.4 according to the vessels age, is to be carried out either at or between the second and third Annual Surveys.

1/C.3.2 Tanks used for salt water ballast where a protective coating is found in POOR condition as defined in 1/B.1.2.9 and the Owners or their representatives elected not to restore the coating, where soft coating has been applied, or where a protective coating has not been applied, are to be internally examined at each subsequent Annual Survey.

1/C.3.3 Where extensive wastage is found, thickness measurements are to be carried out and renewals made when wastage exceeds allowable margins.

#### 1/C.4 ANNUAL SURVEY

#### 1/C.4.1 General

**1/C.4.1.1** The survey is to consist of an examination for the purpose of ensuring, as far as practical, that the hull, hatch covers, coamings and piping are maintained in a satisfactory condition and is to take into account the following:

- a) Service history,
- b) Conditions and extent of Corrosion Prevention Systems of ballast tanks,
- c) Areas identified in the Survey Report File.

#### 1/C.4.2 Examination of Hull

1/C.4.2.1 Examination of the hull plating and its closing appliances as far as can be seen.

1/C.4.2.2 Examination of watertight penetrations as far as practicable.

1/C.4.3 Examination of Hatch Covers and Coamings 1/C.4.3.1 (1998) Confirmation that no unapproved changes have been made to the hatch covers, hatch coamings and their securing and sealing devices since the last survey. Exposed hatch covers are to be examined to confirm structural integrity and capability of maintaining weathertightness. Where extensive areas of wastage of steel hatch covers is found, thickness measurements are to be carried out and renewals and/or repairs made when wastage ex-

ceeds allowable margins.

1/C.4.3.2 Where mechanically operated steel covers are fitted, examination of:

- hatch covers including Close-up Survey of plating and stiffeners:
- b) tightness devices of longitudinal, transverse and intermediate cross junctions (gaskets, gasket lips, compression bars, drainage channels);
- c) clamping devices, retaining bars, cleating;
- d) chain or rope pulleys;
- e) guides;
- f) guide rails and track wheels;
- g) stoppers, and similar devices;
- h) wires, chains, gypsies, tensioning devices;
- i) hydraulic system essential to closing and securing;
- *j*) safety locks and retaining devices;
- *k*) loading pads/bars and the side plate edge;
- *l*) guide plates and chocks;
- m) compression bars, drainage channels and drain pipes (if any).

Where wooden covers on portable beams or steel pontoons are fitted, examination of:

- wooden covers and portable beams, carriers or sockets for the portable beam, and their securing devices;
- b) steel pontoons, including Close-up Survey of hatchcover plating;
- c) tarpaulins;
- d) cleats, battens and wedges;
- e) hatch securing bars and their securing devices.

**1/C.4.3.3** Examination, including Close-up Survey, of hatch coaming plating including deck connection, stiffeners, stays, pads, chocks, and brackets.

**1/C.4.3.4** Confirmation of the satisfactory operation of all mechanically operated hatch covers is to be made, including:

- a) stowage and securing in open condition;
- b) proper fit and efficiency of sealing in closed condition;
- operational testing of hydraulic and power components, wires, chains and link drives.

1/C.4.3.5 Where the omission of gaskets has been approved in accordance with 3/18.10.1, the satisfactory condition of specially approved details such as labyrinths is to be verified.

## 1/C.4.4 Examination of Cargo Holds

**1/C.4.4.1** For Bulk Carriers over 10 years of age:

- a) An internal examination is to be carried out in all the holds, particular attention being paid to tank tops, transverse watertight bulkheads, stool structure (externally), side plating, framing and attachment.
- b) Close-up examination of sufficient extent, minimum 25% of frames, to establish the condition of the lower region of the shell frames including approx. lower one third length of side frame at side shell and side frame end attachment and the adjacent shell plating in the forward cargo hold.

Where deemed necessary by the Surveyor, as a result of the Overall and Close-up Survey as described in 1/C.4.4.1a and b, the survey is to be extended to include a Close-up Survey of all of the shell frames and adjacent shell plating of that cargo hold as well as a Close-up Survey of sufficient extent of all remaining cargo holds.

c) Thickness gauging may be required. Where substantial corrosion as defined in 1/C.1.2.7 is found, additional thickness measurements are to be carried out in accordance with the requirements of Table 1/C.8.

1/C.4.4.2 For Bulk Carriers over 15 years of age:

- a) An internal examination is to be carried out in all the holds, particular attention being paid to tank tops, transverse watertight bulkheads, stool structure (externally), side plating, framing and attachment.
- b) Close-up examination of sufficient extent, minimum 25% of frames, to establish the condition of the lower region of the shell frames including approx. lower one third length of side frame at side shell and side frame end attachment and the adjacent shell plating in the forward cargo hold and one other selected hold. Where deemed necessary by the Surveyor, as a result of the Overall and Close-up Survey as described in 1/C.4.4.2 a and b, the survey is to be extended to include a Close-up Survey of all of the shell frames and adjacent shell plating of that cargo hold as well as a Close-up Survey of sufficient extent of all remaining cargo holds.
- c) Thickness gauging may be required. Where substantial corrosion as defined in 1/C.1.2.7 is found, additional thickness measurements are to be carried out in accordance with the requirements of Table 1/C.8.

#### 1/C.4.5 Examination of Ballast Tanks

**1/B.4.5.1** (1998) Examination of ballast tanks when required as a consequence of the results of the Special Survey

or Intermediate Survey. Where extensive areas of wastage are found, thickness measurements are to be carried out and renewals and/or repairs made when wastage exceeds allowable margins.

**1/B.4.5.2** (1998) Examination of all ballast tanks where substantial corrosion is documented. Thickness measurements are to be taken to confirm condition of substantially corroded areas and renewals and/or repairs made when wastage exceeds allowable margins.

## 1/C.5 Preparations for Special Survey

#### 1/C.5.1 Planning

1/C.5.1.1 Survey planning is to be worked out in advance of each Special Survey by the Owner in cooperation with the Bureau. The Survey Plan shall be in a written format.
1/C.5.1.2 The following documentation should be collected and consulted with a view to selecting tanks, areas, and structural elements to be examined:

- Survey status and basic ship information,
- Documentation on-board, as described in 1/C.6.2 and 1/C.6.3,
- Main structural plans, including information regarding use of higher strength steels,
- Relevant previous survey and inspection reports from both the Bureau and the Owner,
- Information regarding the use of the ship's holds and tanks, typical cargoes and other relevant data,
- Information regarding corrosion protection level on the new building,
- Information regarding the relevant maintenance level during operation.

1/C.5.1.3 Survey planning is to account for and comply with the requirements of Tables 1/C.1, 1/C.2 and paragraph 1/C.2.7 for Close-up Survey, thickness measurement and tank testing, respectively, and is to consider relevant information including at least:

- Basic ship information and particulars,
- Main structural plans, including information regarding use of higher strength steels,
- Plan of holds and tanks,
- List of holds and tanks with information on use, protection and condition of coating,
- Conditions for survey (e.g., information regarding hold and tank cleaning, gas freeing, ventilation, lighting, etc.),
- Provisions and methods for access to structures,
- Equipment for surveys,
- Holds and tanks and areas selected for Close-up Survey (per Table 1/C.1),
- Structures selected for thickness measurement (per Table 1/C.2),
- Tanks selected for tank testing (per paragraph 1/ C.2.7),
- Damage experience related to the vessel.

1/C.5.1.4 The Bureau will advise the Owner of the maximum acceptable structural wastage allowances applicable to the vessel.

**1/C.5.1.5** Guidelines for Technical Assessment in Conjunction with Planning for Enhanced Surveys of Bulk Carriers, contained in Annex 1/C.2, may be referred to in conjunction with the planning preparation.

Where considered necessary and appropriate by the Bureau, these Guidelines will be made mandatory.

#### 1/C.5.2 Conditions for Survey

**1/C.5.2.1** The Owner is to provide the necessary facilities for a safe execution of the survey.

1/C.5.2.2 Tanks and spaces are to be safe for access, i.e. gas freed, ventilated, etc.

1/C.5.2.3 Tanks and spaces are to be sufficiently clean and free from water, scale, dirt, oil residues, etc. to reveal significant corrosion, deformation, fractures, damages or other structural deterioration. In particular this applies to areas which are subject to thickness measurement.

1/C.5.2.4 Sufficient illumination is to be provided to reveal significant corrosion, deformation, fractures, damages or other structural deterioration.

#### 1/C.5.3 Access to Structures

1/C.5.3.1 For Overall Survey, means are to be provided to enable the Surveyor to examine the hull structure in a safe and practical way.

1/C.5.3.2 For Close-up Survey in cargo holds and ballast tanks, one or more of the following means for access, acceptable to the Surveyor, is to be provided:

- a) permanent staging,
- b) temporary staging, e.g. ladders,
- c) lifts and moveable platforms,
- d) other equivalent means.

# 1/C.5.4 Equipment for Survey

1/C.5.4.1 Thickness measurements are normally to be carried out by means of ultrasonic test equipment. The accuracy of the equipment is to be proven to the Surveyor as required.

1/C.5.4.2 One or more of the following fracture detection procedures may be required if deemed necessary by the Surveyor:

- a) radiographic equipment,
- b) ultrasonic equipment,
- c) magnetic particle equipment,
- $\vec{d}$ ) dye penetrant.

## 1/C.5.5 Survey at Sea or at Anchorage

**1/C.5.5.1** Survey at sea or at anchorage may be accepted provided the Surveyor is given the necessary assistance from the personnel onboard. Necessary precautions and procedures for carrying out the survey are to be in accordance with 1/C.5.1, .5.2, .5.3 and .5.4.

1/C.5.5.2 A communication system is to be arranged between the survey party in the tank and the responsible officer on deck.

#### 1/C.6 Documentation on Board

#### 1/C.6.1 General

**1/C.6.1.1** The Owner is to supply and maintain onboard documentation as specified in 1/C.6.2 and 1/C.6.3, which should be readily available for the Surveyor.

**1/C.6.1.2** The documentation is to be kept on board for the lifetime of the ship.

#### 1/C.6.2 Survey Report File

1/C.6.2.1 A Survey Report File is to be a part of the documentation on board consisting of:

- a) Reports of structural surveys
- b) Condition Evaluation Reports
- c) Thickness measurement reports
- d) Survey Plan as noted in 1/C.5.1 until such time as the Special Survey has been completed.

**1/C.6.2.2** The Survey Report File is also to be available in the Owner's management office.

#### 1/C.6.3 Supporting Documents

1/C.6.3.1 The following additional documentation is to be available onboard:

- a) Main structural plans of cargo and ballast tanks
- b) Previous repair history
- c) Cargo and ballast history
- d) Inspections and action taken by ship's personnel with reference to:
  - *i* structural deterioration in general
  - ii leakages in bulkheads and piping closing an
  - *iii* condition of coating or corrosion protection, if any A guidance for reporting is shown in Table 1/C.3.
- e) any other information that will help to identify critical structural areas and/or suspect areas requiring inspection.

#### 1/C.7. Procedures for Thickness Measurements

#### 1/C.7.1 General

1/C.7.1.1 Thickness measurements are to be carried out under the guidance of the Surveyor. Consideration may be given in special circumstances to accepting thickness measurements taken where a Surveyor was not in attendance.

# 1/C.7.2 Certification of Thickness Measurement Company

1/C.7.2.1 The thickness measurements are to be carried out by a qualified company certified by the Bureau according to principles stated in Table 1/C.5.

#### 1/C.7.3 Reporting

1/C.7.3.1 A thickness measurement report is to be prepared and submitted to the attending Surveyor. The report is to give the location of measurements, the thickness measured as well as corresponding original thickness.

Furthermore, the report is to give the date when the measurements were carried out, type of measuring equipment, names of personnel and their qualifications and has to be signed by the operator. The thickness measurement report is to follow the principles as specified in the Annex 1/C.1 Recommended Procedures for Thickness Measurements of Bulk Carriers.

**1/C.7.3.2** The Surveyor is to verify and countersign the thickness measurement report.

#### 1/C.8. Reporting and Evaluation of Survey

## 1/C.8.1 Evaluation of Survey Report

1/C.8.1.1 The data and information on the structural condition of the vessel collected during the survey is to be evaluated for acceptability and continued structural integrity of the vessel.

#### 1/C.8.2 Reporting

1/C.8.2.1 Principles for survey reporting are shown in Table 1/C.6.

**1/C.8.2.2** A Condition Evaluation Report of the survey is to be issued to the Owner as shown in Table 1/C.7 and placed on board the vessel for reference at future surveys.

cargo hold hatches. [E]

TABLE 1/C.1 Requirements for Close-up Survey at Special Survey of Bulk Carriers

Special Periodical Survey Number 1	Special Periodical Survey Number 2	Special Periodical Survey Number 3	Subsequent Special Periodical Surveys
(Age < 5 years)	(5 < Age < 10  years)	(10 < Age < 15 years)	(Age > 15 years)
<ol> <li>25% of shell frames in the forward cargo hold at rep- resentative positions. Representative frames in remaining cargo holds. [A]</li> </ol>	1. 25% of shell frames in all cargo holds including up- per and lower end attach- ments and adjacent shell plating. [A]	1. All shell frames in the forward cargo hold and 25% of frames in remaining cargo holds including upper and lower end attachments and adjacent shell plating. [A]	<ol> <li>All shell frames in all cargo holds including up- per and lower end attach- ments and adjacent shell plating. [A]</li> </ol>
2. One transverse web with associated plating and longitudinals in two representative ballast tanks of each type (i.e. topside, hopper side or side tank.) [B]	2. One transverse web with associated plating and longitudinals in all ballast tanks. [B]	2. All transverse webs with associated plating and longitudinals in all ballast tanks.  [B]	2. All transverse webs with associated plating and longitudinals in all ballast tanks.  [B]
3. Two cargo hold transverse bulkheads. [C]	3. Forward and aft transverse bulkheads in one top side ballast tank, including stiff- ening system. [B]	3. All transverse bulkheads in ballast tanks, including stiffening systems. [B]	3. All transverse bulkheads in ballast tanks, including stiffening system. [B]
4. All cargo hold hatch covers and coamings. [D]	4. One transverse bulkhead in each cargo hold. [C]	4. All cargo hold transverse bulkheads, including internal structure of upper and lower stools, where fitted.  [C]	4. All cargo hold transverse bulkheads, including internal structure of upper and lower stools where fitted.  [C]
	<ul><li>5. All cargo hold hatch covers and coamings. [D]</li><li>6. All deck plating inside line</li></ul>	<ul><li>5. All cargo hold hatch covers and coamings. [D]</li><li>6. All deck plating inside line</li></ul>	<ul><li>5. All cargo hold hatch covers and coamings. [D]</li><li>6. All deck plating inside line</li></ul>
	of hatch openings between	of hatch openings between	of hatch openings between

#### NOTES:

1. With reference to cargo and ballasting history and coating arrangements, tanks and holds should be selected for Close-up Surveys which will provide the best representative sampling of areas likely to be most exposed to the effects of corrosion, swash or stress

cargo hold hatches. [E]

- 2. Close-up Surveys are to include welded attachments.
- 3. Close up survey of transverse bulkheads to be carried out at four levels:

cargo hold hatches. [E]

- Level (a) Immediately above the inner bottom and immediately above line of gussets (if fitted) and shedders for ships without lower stool.
- Level (b) Immediately above and below the lower stool shelf plate (for those ships fitted with lower stools), and immediately above the line of the shedder plates.
- Level (c) About mid height of the bulkhead.
- Level (d) Immediately below the upper deck plating and immediately adjacent to the upper wing tank, and immediately below the upper stool shelf plate for those ships fitted with upper stools, or immediately below the topside tank.
- 4. Refer to figures in Annex 1/C.1.
- [A] Cargo hold transverse frames.
- [B] Transverse web frame or watertight transverse bulkhead in water ballast tanks.
- [C] Cargo hold transverse bulkheads plating, stiffeners and girders.
- [D] Cargo hold hatch covers and coamings.
- [E] Deck plating inside line of hatch openings between cargo hold hatches.

TABLE 1/C.2 Requirements for Thickness Measurements at Special Survey of Bulk Carriers

Special Periodical Survey	<b>Special Periodical Survey</b>	<b>Special Periodical Survey</b>	Subsequent Special
Number 1	Number 2	Number 3	<b>Periodical Surveys</b>
$(Age \le 5 \text{ years})$	$(5 < Age \le 10 \text{ years})$	$(10 < Age \le 15 \text{ years})$	(Age > 15 years)
1. Suspect areas throughout the vessel.	<ol> <li>Two transverse sections of deck plating outside the line of cargo hatch open- ings and abreast cargo hatch openings.</li> </ol>	All main deck plating within the cargo area.	1. All main deck plating within the cargo area, all exposed main deck plating outside of cargo area, and all exposed first-tier superstructure deck plates (poop, bridge and forecastle decks).
2. Measurement, for general assessment and recording of corrosion patterns, of structural members subject	2. Plates in two wind-and-water strakes in way of the transverse sections considered under point 1 above.	2. Two transverse sections within the amidships 0.5L.	2. A minimum of three transverse sections within the amidships 0.5L.
to Close-up Surveys.	3. All cargo hold hatch covers and coamings (plating and stiffeners).	3. All plating in two wind- and-water strakes port and starboard, full length.	3. All plating in two wind- and-water strakes, port and starboard, full length.
	<ol> <li>All deck plating inside the line of openings between cargo hold hatches.</li> </ol>	4. All cargo hold hatch covers and coamings (plating and stiffeners).	4. All cargo hold hatch covers and coamings (plating and stiffeners).
	5. Measurement, for general assessment and recording of corrosion patterns, of structural members subject to Close-up Surveys.	5. Plating and stiffeners of transverse bulkheads and internals in forepeak and afterpeak tanks.	5. Plating and stiffeners of transverse bulkheads and internals in forepeak and afterpeak tanks.
	6. Suspect areas throughout the vessel.	6. Measurements, for general assessment and recording of corrosion patterns, of structural members subject to Close-up Surveys	6. Duct keel or pipe tunnel plating and internals
		7. Suspect areas throughout the vessel.	7. All keel and bottom plates, full length.
			8. Measurement, for general assessment and recording of corrosion patterns, of structural members subject to Close-up Surveys.
			9. Suspect areas throughout the vessel.

- 1. Definition of transverse section (girth belt/belt). A transverse section includes all longitudinal members such as plating, longitudinals
- and girders at the deck, side, bottom; inner bottom and hopper side, longitudinal bulkhead and of topside tank bottom.

  2. With reference to cargo/ballast history and arrangement and condition of coatings, tanks and specific thickness gauging locations should be selected which will provide the best representative sampling of areas likely to be most exposed to corrosion effects.
- 3. (1998) As noted in 1/C.2.6.4 where coatings are found in GOOD condition as defined in 1/C.1.2.9 the extent of thickness measurements of structural members in any way of Close-up Surveys may be modified by the Surveyor. After Special Survey No. 2, modification of the extent of thickness measurements of structural members subject to Close-up Surveys is to be specially considered.

# TABLE 1/C.3

Ship Name:					
OWNE	RS INSPECTIO	N REPORT	- Structu	ral Condition	
	For T	ank/Hold	No.:		
Grade of Steel:	Deck Bottom	:		Side Long. Bhd.	: :
Elements Cracks Other	Buckles	Corr- osion	Coating cond.	Pitting	Mod. /Rep.
Deck:					
Bottom:					
Side:					
Side framing:					
Long.					
Bulkheads:					
Transv. Bulkheads:					
* Repairs carried out due to:					
		,			
Thickness measurements carried out, dates: Results in General:					
Overdue Surveys:					
Outstanding Conditions of class:					
Comments:					
*Repairs are to be surveyed by an ABS Surveyor					
Date of Inspection:					

# TABLE 1/C.4 (1998)

# Overall Survey, Close-Up Survey and Thickness Measurement Requirements at Intermediate Survey of Bulk Carriers

5 < AGE ≤ 10	$10 < AGE \le 15$	AGE > 15
Overall Survey of at least three (3) representative ballast tanks selected by the Surveyor. <sup>1</sup> Where no protective coating is found; where protective coating is found in POOR condition; or where corrosion or other defects are found; the Overall Survey is to be extended to other ballast tanks of the same type.	Overall Survey of all ballast tanks. <sup>1</sup>	Overall Survey of all ballast tanks. <sup>1</sup>
Overall Survey of all cargo holds.	Overall Survey of all cargo holds.	Overall Survey of all cargo holds.
Close-up Survey, <sup>2,3</sup> in the forward hold and one other hold, of sufficient extent (at least 25% of shell frames) to establish condition of:  • shell frames, upper and lower end attachments, and adjacent shell plating,  • transverse bulkheads. <sup>4</sup>	Close-up Survey, 3.5 in all cargo holds, of sufficient extent (at least 25% of shell frames) to establish condition of:  • shell frames, upper and lower end attachments and adjacent shell plating,  • transverse bulkheads.4	Close-up Survey, <sup>3</sup> in all cargo holds, of:  all shell frames, upper and lower end attachments, and adjacent shell plating, transverse bulkheads. <sup>4</sup>
Overall and Close-up Survey of suspect areas, as defined by 1/C.1.2.6, identified at previous Special Survey.	Overall and Close-up Survey of suspect areas, as defined by 1/C.1.2.6, identified at previous Special Survey.	Overall and Close-up Survey of suspect areas, as defined by 1/C.1.2.6, identified at previous Special Survey.
Thickness measurements of sufficient extent to determine general and local corrosion levels of areas subject to Close-up Survey. <sup>6,7</sup>	Thickness measurements of sufficient extent to determine general and local corrosion levels of areas subject to Close-up Survey. <sup>6,7</sup>	Thickness measurements of sufficient extent to determine general and local corrosion levels of areas subject to Close-up Survey. <sup>6,7</sup>
Thickness measurements of suspect areas, as defined by 1/C.1.2.6, identified at previous Special Survey. <sup>6,7</sup>	Thickness measurements of suspect areas, as defined by 1/C.1.2.6, identified at previous Special Survey. <sup>6,7</sup>	Thickness measurements of suspect areas, as defined by 1/C.1.2.6, identified at previous Special Survey. <sup>6,7</sup>

- 1 If no visible structural defects are found during Overall Survey, the examination may be limited to a verification that the protective coating remains effective.
- 2 When deemed necessary by the Surveyor as a result of the Overall Survey of cargo holds and Close-up Survey of side shell frames and transverse bulkheads, the survey is to be extended to include a Close-up Survey of all the shell frames and adjacent shell plating of that cargo hold and a Close-up Survey of sufficient extent of all remaining cargo holds.
- 3 For areas in cargo holds where coatings are found in GOOD condition, as defined in 1/C.1.2.9, the extent of Close-up Surveys may be specially considered.
- 4 Transverse bulkheads include bulkhead stiffening system.
- 5 When deemed necessary by the Surveyor as a result of the Overall Survey of cargo holds and Close-up Survey of side shell frames and transverse bulkheads, the survey is to be extended to include a Close-up Survey of all the shell frames and adjacent shell plating of all cargo holds.
- 6 The thickness measurements may be waived provided the Surveyor is satisfied by the Close-up Survey that there is no structural diminution and the protective coating, where provided, remains effective.
- 7 When Substantial Corrosion is found, additional thickness measurements are to be taken in accordance with Table 1/C.8.

#### TABLE 1/C.5

# Procedures for Certification of Firms Engaged in Thickness Measurement of Hull Structures

#### 1. Application

This guidance applies for certification of the firms which intend to engage in the thickness measurement of hull structures of the vessels.

#### 2. Procedures for Certification

(1) Submission of Documents;

The following documents are to be submitted to the Bureau for approval.

- a) Outline of firms, e.g. organization and management structure.
- b) Experience of the firms on thickness measurement inter alia of hull structures of the vessels.
- c) Technicians careers, i.e. experiences of technicians as thickness measurement operators, technical knowledge of hull structure, etc. Operators should be qualified according to a recognized industrial NDT Standard.
- d) Equipment used for thickness measurement such as ultra-sonic testing machines and its maintenance/calibration procedures.
- e) A guide for thickness measurement operators.
- f) Training programs of technicians for thickness measurement.
- g) Measurement record format in accordance with Annex 1/C.1 Recommended Procedures for Thickness Measurements.
- (2) Auditing of the firms

Upon reviewing the documents submitted with satisfactory results, the firm is audited in order to ascertain that the firm is duly organized and managed in accordance with the documents submitted, and eventually is capable of conducting thickness measurement of the hull construction of the ships.

(3) Certification is conditional on an onboard demonstration of thickness measurement as well as satisfactory reporting.

#### 3. Certification

- (1) Upon satisfactory results of both the audit of the firm in 2(2) and the demonstration tests in 2(3) above, the Bureau will issue a Certificate of Approval as well as a notice to the effect that the thickness measurement operation system of the firm has been certified by the Bureau.
- (2) Renewal/endorsement of the Certificate is to be made at intervals not exceeding 3 years by verification that original conditions are maintained.

# 4. Information of any alteration to the Certified Thickness Measurement Operation System

In case where any alteration to the certified thickness measurement operation system of the firm is made, such an alteration is to be immediately informed to the Bureau. Re-audit is made where deemed necessary by the Bureau.

#### 5. Cancellation of Approval

Approval may be cancelled in the following cases:

- (1) Where the measurements were improperly carried out or the results were improperly reported.
- (2) Where the Bureau's Surveyor found any deficiencies in the approved thickness measurement operation systems of the firm.
- (3) Where the firm failed to inform of any alteration in 4 above to the Bureau.

## TABLE 1/C.6

# Reporting Principles

In principle, the following items pertaining to bulk carrier structures are to be included in the reporting form as applicable for the type of survey:

- 1.0 Type of Survey (Special Survey, Intermediate Survey, Annual Survey, Other)
- 2.0 Extent of the Survey
- 2.1 Identification of overall surveyed spaces.
- 2.2 The locations in each hold where Close-up Survey has been carried out, and means of access.
- 2.3 Identification of tanks and location of structures where the thickness measurements were carried out.
- 2.4 Identification of pressure tested spaces.
- 3.0 Results of the Survey
- 3.1 Coating condition of each space (if applicable). Identify tanks with anodes.
- 3.2 Structural condition of each space:
- 3.2.1 Identify space found in satisfactory condition.
- 3.2.2 Identify all conditions found which should be corrected or recorded, such as:
  - a Corrosion: Structure members
    - Type of Corrosion (Pitting, General)
    - Extent
  - b Cracks (location)
  - c Buckling (location)
  - d Indents (location)

The narrative reports may be supplemented by sketches/photos of damages/repairs.

3.3 Thickness measurement report endorsed by the attending class Surveyor.

#### 4.0 Actions to possible findings:

- 4.1 Repair in identified spaces:
  - a Structural member
  - b Repair method
  - c Repair extent
- 4.2 Recorded findings considered not to necessitate repairs. Memoranda for future inspections and thickness measurements to be given, e.g. for areas found as suspect with respect to corrosion (ref. 1/C.1.2.6).
- 4.3 Condition of Class (Recommendations)

# TABLE 1/C.7a **Condition Evaluation Report**

Issued upon Completion of Special Survey

GENERAL PARTICULARS	
SHIPS NAME:	ABS IDENTIFICATION NUMBER:
	IMO IDENTITY NUMBER:
PORT OF REGISTRY:	NATIONAL FLAG:
DEADWEIGHT (M. TONNES):	GROSS TONNAGE:
DATE OF BUILD:	CLASSIFICATION NOTATION:
DATE OF MAJOR CONVERSION:	OWNER
TYPE OF CONVERSION	

- The survey reports and documents listed below have been reviewed by the undersigned and found to be satisfactory. a)
- A Summary of the survey is attached herewith on sheet 2. b)
- The hull special survey as been completed in accordance with the Regulations on [date].

Condition Evaluation Report completed by:	<u>Name</u> Signature	<u>Title</u>
OFFICE	DATE	
ConditionEvaluation Report verified by:	<u>Name</u> Signature	<u>Title</u>
OFFICE	DATE	

Attached reports and documents:

- 2)
- 3)
- 4)
- 5) 6)

# TABLE 1/C.7b Condition Evaluation Report

A) General Particulars: - Ref. Table 1/C.7a

B) Report Review: - Where and how survey was done

C) Close-up Survey: - Extent (Which tanks/holds)

D) Thickness

measurements: - Reference to Thickness Measurement report

Summary of where measured

Separate form indicating the Spaces with Substantial corrosion, and corresponding

Thickness diminutionCorrosion pattern

E) Tank Protection: Separate form indicating:

Location of coating/anodes

Condition of coating (as applicable)

F) Repairs: - Identification of spaces/areas

G) Condition of Class/Recommendations:

H) Memoranda: - Items noted for record

Any points of attention for future surveys, e.g. for Suspect Areas.
 Extended Annual/Intermediate Survey due to coating breakdown

I) Conclusion: - Statement on evaluation/verification of Survey report

# TABLE 1/C.7c **Extract of Thickness Measurements**

Reference is made to the thickness measurements report:

1 Position of substantially corroded Spaces/Areas.	Thickness dimunition [%]	2 Corrosion pattern	Remarks: e.g. Ref. attached sketches

#### Remarks

- 1  $\,$  Substantial corrosion, i.e. 75–100% of acceptable margins wasted
- 2 P = Pitting C = Corrosion in General

# TABLE 1/C.7d Tank/Hold Protection

1	2	3	
Tank/hold Nos.	Tank/hold protection	Coating condition	Remarks

#### Remarks

- 1 All Ballast Tanks and cargo holds to be listed.
- 2 C = Coating A = Anodes NP = No Protection 3 Coating condition according to the following standard. GOOD

condition with only minor spot rusting. condition with local breakdown at edges of stiffeners and weld connections and/or light rusting over 20% or more of areas under **FAIR** consideration, but less than as defined for POOR condition.

**POOR** condition with general breakdown of coating over 20% or more of areas or hard scale at 10% or more of areas under consideration.

If coating condition "POOR" is given, extended annual surveys are to be introduced. This is to be noted in part H) of the Condition Evaluation Report in Table 1/C.7b.

# TABLE 1/C.8

Requirements for extent of thickness measurement at those areas of Substantial Corrosion. Special Survey of Bulk Carriers within the cargo area.

# SHELL PLATING

Structural Member	Extent of Measurement	Pattern of Measurement
1. Bottom and Side Shell Plating	a. Suspect plate, plus four adjacent plates	a. 5 point pattern for each panel between longitudinals
	<ul> <li>See other tables for particulars on gauging in way of tanks and cargo holds</li> </ul>	
2. Bottom/Side Shell longitudinals	Minimum of three longitudinals in way of suspect areas	3 measurements in line across web 3 measurements on flange

Sheet 1

# TRANSVERSE BULKHEADS IN CARGO HOLDS

Structural Member	Extent of Measurement	Pattern of Measurement
1. Lower Stool	a. Transverse band within 25 mm of welded connection to inner bottom.	a. 5 point pattern between stiffeners over 1 meter length
	b. Transverse band within 15 mm of welded connection to shelf plate	b. Ditto
2. Transverse Bulkhead. 5 point pattern over 1 sq. meter of plating	a. Transverse band at approximately mid height	a. 5 point pattern over 1 sq meter of plating
	<ul> <li>Transverse band at part of bulkhead adjacent to upper deck or below upper stool shelf plate (for those ships fitted with upper stools).</li> </ul>	b. 5 point pattern over 1 sq meter of plating

# TABLE 1/C.8 (continued)

Requirements for extent of thickness measurement at those areas of Substantial Corrosion. Special Survey of Bulk Carriers within the cargo area.

# DECK STRUCTURE INCLUDING CROSS STRIPS, MAIN CARGO HATCHWAYS, HATCH COVERS, COAMINGS AND TOPSIDE TANKS

Structural Member	Extent of Measurement	Pattern of Measurement
1. Cross Deck Strip plating	Suspect cross deck strip plating	a. 5 point pattern between underdeck stiffeners over 1 meter length
2. Underdeck Stiffeners	a. Transverse members	a. 5 point pattern at each end and mid span
	b. Longitudinal member	b. 5 point pattern on both web and flange
3. Hatch Covers	a. Skirt, each side and ends, 3 locations	a. 5 point pattern at each location
	b. 3 longitudinal bands, outboard strakes (2) and centerline strake (1).	b. 5 point measurement each band
4. Hatch Coamings	Each side and end of coaming, one band lower 1/3, one band upper 2/3 of coaming	5 point measurement each band, i.e. end or side coaming
5. Topside Water Ballast Tanks	a. Watertight transverse bulkheads i. lower 1/3 of bulkhead	i. 5 point pattern over 1 sq. meter of plating
	ii. upper 2/3 of bulkhead	ii. 5 point pattern over 1 sq. meter of
	iii. stiffeners	plating iii. 5 point pattern over 1 meter length
	b. 2 representative swash transverse bulk- heads	i. 5 point pattern over 1 sq. meter of plating
	· 1 1/0 C1 H1 1	
	i. lower 1/3 of bulkhead ii. upper 2/3 of bulkhead	ii. 5 point pattern over 1 sq. meter of plating

# DECK STRUCTURE INCLUDING CROSS STRIPS, MAIN CARGO HATCHWAYS, HATCH COVERS, COAMINGS AND TOPSIDE TANKS (page 3)

Structural Member	Extent of Measurement	Pattern of Measurement
5. Topside Water Ballast Tanks (cont'd)	c. 3 representative bays of slope plating i. lower 1/3 of tank ii. upper 2/3 of tank	<ul><li>c. i. 5 point pattern over 1 sq. meter of plating</li><li>c. ii. 5 point pattern over 1 sq. meter of plating</li></ul>
	d. Longitudinals, suspect and adjacent	d. 5 point pattern both web and flange over 1 meter length
6. Main Deck Plating	Suspect plates and adjacent (4)	5 point pattern over 1 meter length of plating
7. Main Deck Longitudinals	Minimum of 3 longitudinals where plating measured	5 point pattern on both web and flange over 1 meter length
8. Web Frames/Transverses	Suspect plates	5 point pattern over 1 sq. meter

# TABLE 1/C.8 (continued)

Requirements for extent of thickness measurement at those areas of Substantial Corrosion. Special Survey of Bulk Carriers within the cargo area.

# DOUBLE BOTTOM AND HOPPER STRUCTURE

Structural Member	Extent of Measurement	Pattern of Measurement
1. Inner/Double Bottom Plating	Suspect plate plus all adjacent plates	5 point pattern for each panel between longitudinals over 1 meter length
2. Inner/Double Bottom Longitudinals	Three longitudinals where plates measured	3 measurements in line across web and 3 measurements on flange
3. Longitudinal Girders or Transverse floors	b. Suspect plates	b. 5 point pattern over about 1 square meter
4. Watertight Bulkheads (WT Floors)	a. lower 1/3 of tank b. upper 2/3 of tank	<ul><li>a. 5 point pattern over 1 sq. meter of plating</li><li>b. 5 point pattern alternate plates over 1 sq. meter of plating</li></ul>
5. Web Frames	Suspect plating	5 point pattern
	[Conclude shell and bottom longitudinals dealt with on sheet (I) of this Table]	
	CARGO HOLDS	Sheet 4
Structural Member	Extent of Measurement	Pattern of Measurement
1. Side Shell frames	Suspect stiffener and each adjacent	<ul><li>a. At each end and mid span:</li><li>5 point pattern of both web and flange</li></ul>
		b. 5 point pattern within 25 mm of welded attachment to both shell and lower slope plate

Appendix 1/C annex 1/C.1
Procedures for Thickness
Measurements of Bulk Carriers

# Contents

Sheet 1	 Contents
DIICCLI	 Contonio

Sheet 2 — Instructions

Sheet 3 — General particulars

#### REPORTS

- Sheet 4 Report TM1-BC for recording the thickness measurement of all deck plating, all bottom shell plating and side shell plating.
- Sheet 5 Report TM2-BC (i) for recording the thickness measurement of shell and deck plating at transverse sections strength deck and sheerstrake plating.
- Sheet 6 Report TM2-BC (ii) for recording the thickness measurement of shell and deck plating at transverse sections shell plating.
- Sheet 7 Report TM3-BC for recording the thickness measurement of longitudinal members at transverse sections.
- Sheet 8 Report TM4-BC for recording the thickness measurement of transverse structural members.
- Sheet 9 Report TM5-BC for recording the thickness measurement of cargo hold transverse bulkheads.
- Sheet 10 Report TM6-BC for recording the thickness measurement of miscellaneous structural members.
- Sheet 11 Report TM7-BC for recording the thickness measurement of cargo hold transverse frames.

#### GUIDANCE

- Sheet 12 Bulk Carrier typical transverse sections. The diagram includes details of the items to be measured and the report forms to be used.
- Sheet 13 Transverse section outline. This diagram may be used for those ships where the diagram on sheet 12 is not suitable.
- Sheet 14 Sketches of bulk carrier showing typical areas for thickness measurement of cargo hold frames, structural members and transverse bulkheads in association with Close-up Survey requirements.

# ANNEX 1/C.1 Procedures for Thickness Measurements of Bulk Carriers

# **INSTRUCTIONS**

- 1. This document is to be used for recording thickness measurements as required by Table 1/C.1.
- 2. Reporting forms TM1-BC, TM2-BC, TM3-BC, TM4-BC, TM5-BC, TM6-BC and TM7-BC (sheets 4-11) are to be used for recording thickness measurements.
- 3. The remaining Sheets 12-14 are guidance diagrams and notes relating to the reporting forms and the procedure for thickness measurement.
- 4. The reporting forms should, where applicable, be supplemented by data presented on structural sketches.

#### General Particulars

Genera	ii Particulars		
Ships name:-			
IMO number:-			
ABS identification number:-			
Port of registry:-			
Gross tons:-			
Deadweight:-			
Date of build:-			
Classification society:-			
Name of Company performing thickness measurement:-			
Thickness measurement company certified by:-			
Certificate No:-			
Certificate valid from to			
Place of measurement:-			
First date of measurement:-			
Last date of measurement:-			
Special survey/intermediate survey due:-*			
Details of measurement equipment:-			
Qualification of operator:-			
Report Number		consisting of	Sheets
Name of operator:-	. Name of surveyor:-		
Signature of operator:-	. Signature of surveyor:-		
Company official stamp:-	. Classification Society		
	Official Stamp:-		

<sup>\*</sup>Delete as appropriate.

NOTES - See Reverse

Surveyors Signature

Report on THICKNESS MEASUREMENT of ALL DECK PLATING, ALL BOTTOM SHELL PLATING or SIDE SHELL PLATING\*

( \*— delete as appropriate) TM1 -BC

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11th															
10th															
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6th															
7th															
8th															
9th															
10th															
11th															
12th															

Sheet 4

Operators Signature ...

- 1. This report is to be used for recording the thickness measurement of:-
  - A- All strength deck plating within the cargo area.
  - B- All keel, bottom shell plating within the cargo area.
  - C- Side shell plating that is all wind and water strakes within the cargo area.
  - D- Side shell plating that is selected wind and water strakes outside the cargo area.
- 2. The strake position is to be clearly indicated as follows:
  - 2.1 For strength deck indicate the number of the strake of plating inboard from the stringer plate.
  - 2.2 For bottom plating indicate the number of the strake of plating outboard from the keel plate.
  - 2.3 For side shell plating give number of the strake of plating below sheerstrake and letter as shown on shell expansion.
- 3. Only the deck plating strakes outside line of openings are to be recorded.
- 4. Measurements are to be taken at the forward and aft areas of all plates and the single measurements recorded are to represent the average of multiple measurements.

NOTES -- See Reverse

Surveyors Signature .....

Report on THICKNESS MEASUREMENT OF SHELL AND DECK PLATING (one, two or three transverse sections) TM2-BC (I)

		STRAKE	POSITION	Stringer Plate	1st strake inboard	2nd	3rd	4th	5th	eth	7th	8th	9th	10th	11th	12th	13th	14th	centre strake	sheer strake	TOPSIDE TOTAL	
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	<b> </b>	Org.																				
	3ST TE	Gau	۵																			
	FIRST TRANSVERSE NUMBER	Gauged	s																			
		Dimir	mm																			
J,	AT FRAME	Diminution P	%																			
TREN	ш	Diminution S	E																			
IGTH		tion	%																			
DECK	SE	<u>.</u>	7																			
AND	COND	Org.	¥ ¥																			
SHEE	TRANS	Gauged	۵																			
STRENGTH DECK AND SHEERSTRAKE PLATING	SECOND TRANSVERSE SECTION AT FRAME NUMBER		S																			
AKE	SECTI	Diminution P	E E																			
PLATI	DN AT		%																			
NG	FRAME	Diminution S	m m																			
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	THIRD TRANSVERSE SECTION AT FRAME NUMBER	Org.	<u>ا ځ</u>		_																	
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	AT FRA		ш %																			
	١ME	Diminution S	% ww					-														

Operators Signature .....

1. This report is to be used for recording the thickness measurement of:-

Strength deck plating and sheerstrake plating transverse sections:-

Two or three sections within the cargo area, comprising of the structural items (1), (2) and (3) as shown on the diagram of typical transverse section.

- 2. Only the deck plating strakes outside the line of openings are to be recorded.
- 3. The topside area comprises deck plating, stringer plate and sheerstrake (including rounded gunwales).
- 4. The exact frame station of measurement is to be stated.
- 5. The single measurements recorded are to represent the average of multiple measurements.

NOTES - See Reverse

Surveyors Signature ....

Report on THICKNESS MEASUREMENT OF SHELL AND DECK PLATING (one, two or three transverse sections) TM2-BC (II)

Class Identity No.

Ship's Name

Report No. .....

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$\vdash$	No.	Org.	Gauged	-	Diminution P	tion	Diminution S	_	No.	Org.	Gauged	70	Diminution P	<u>6</u>	Diminution S	_	Ö F	Org.	Gauged		Diminution P	$\Box$	Diminution S
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			H																				
																						_	
																							_
			<u></u>																				
																				_			
													-										
																							_
BOTTOM TOTAL	_				-												_						

Sheet 6

Operators Signature .....

1. This report is to be used for recording the thickness measurement of:-

Shell plating transverse sections:-

Two or three sections within the cargo area comprising of the structural items (4), (5), (6) and (7) as shown on the diagram of typical transverse section.

- 2. The bottom area comprises keel, bottom and bilge plating.
- 3. The exact frame station of measurement is to be stated.
- 4. The single measurements recorded are to represent the average of multiple measurements.

Report on THICKNESS MEASUREMENT OF LONGITUDINAL MEMBERS (one, two or three transverse sections)

Report No.

Class Identity No. .....

Ship's Name

TM3-BC

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	Item	S											
	STRUCTURAL	MEMBEH											

ABS® Rules for Building and Classing Steel Vessels 1998-1999

1. This report is to be used for recording the thickness measurement of:-

Longitudinal Members at transverse sections:-

Two or three sections within the cargo area, comprising of the structural items (8) to (20) as shown on the diagram of typical transverse section.

- 2. The exact frame station of measurement is to be stated.
- 3. The single measurements recorded are to represent the average of multiple measurements.

Report No. ..... Report on THICKNESS MEASUREMENT OF TRANSVERSE STRUCTURAL MEMBERS in the double bottom, hopper side and topside water ballast tanks Class Identity No. .... Ship's Name TM4-BC

	Diminution Diminution P	mm % mm									Surveyors Signature NOTES - See Reverse
	Gauged	Р									
	Original Thickness	mm									Signature
	WEL										JORANJIS
TANK DESCRIPTION:	STRUCTURALMEMBER										Oneratore Girnature

- 1. This report is to be used for recording the thickness measurement of transverse structural members, comprising of the appropriate structural items (23) to (25) as shown on diagram of typical transverse section sheet 12 of this document.
- 2. Guidance for areas of measurement is indicated on the diagrams shown on sheet 14 of this document.
- 3. The single measurements recorded are to represent the average of multiple measurements.

NOTES - See Reverse

HOLD/BULKHEAD DESCRIPTION:  LOCATION OF STRUCTURAL COMPONENT (PLATING/STIFFENER)  STRUCTURAL COMPONENT (PLATING/STIFFENER)  STRUCTURAL COMPONENT (PLATING/STIFFENER)  Thickness Port Starboard mm % mm	HOLD/BULKHEAD DESCRIPTION:  LOCATION OF STRUCTURE:  STRUCTURAL COMPONENT (PLATING/STIFFENER)  STRUCTURAL COMPONENT (PLATING/STIFFENER)  FF  Cauged  Thickness  Port Start  Port Start  Start  Thickness  Thicknes	Ms-BC	REPORT OF THICKNESS WEASONEMEN! OF CARGO HOLD I HANSVENSE BOLKNEADS	OLU IRAIN	OVERSE D	ULNDEAD	o I			
FFAME No. :   COCATION OF STRUCTURE :   FFAME NO. :   FF	HOLD/BULKHEAD DESCRIPTION :   LOCATION OF STRUCTURE:   STRUCTURE	Ship's Name					t No.			
Thickness   STRUCTURAL COMPONENT (PLATING/STIFFENER)	COCATION OF STRUCTURE:    Cocation of Structure   Cocation of Co	HOLD/BULKHE	AD DESCRIPTION :							
STRUCTURAL COMPONENT (PLATING/STIFFENER)  Thickness Thickness Therefores The Component (PLATING/STIFFENER)  Thickness Thickness Therefores The Component (PLATING/STIFFENER)  Thickness Thickness Therefore Th	STRUCTURAL COMPONENT (PLATING/STIFFENER)  Thickness	LOCATION OF	STRUCTURE :			FRAME	No. :			
Min   Port   Starboard   min   %	mm Seriosed mm % mm			Original Thickness	Gau	pəfi	Dimin P	ution	Dimin	ution
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Sheet 9	Sheet 9									
Sheet 9	Sheet 9									
Sheet 9	Sheet 9									
Sheet 9	Sheet 9									
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Sheet 9	Sheet 9				-					
Sheet 9	Sheet 9									
sheet 9	sheet 9	9								
at 9	at 9	ihe								
		of Q								

- 1. This report form is to be used for recording the thickness measurement of cargo hold transverse bulkheads.
- 2. Guidance for areas of measurement is indicated on the diagrams shown on sheet 14 of this document.
- 3. The single measurements recorded are to represent the average of multiple measurements.

NOTES - See Reverse SKETCH Report No. ..... Report on THICKNESS MEASUREMENT OF MISCELLANEOUS MEMBERS Surveyors Signature ..... Diminution S Diminution P E Class Identity No. ..... S Gauged Description LOCATION OF STRUCTURE: STRUCTURAL MEMBER: Operators Signature ..... Ship's Name ... TM6-BC

- 1. This report form is to be used for recording the thickness measurement of miscellaneous structural members including the structural items (28), (29), (30) and (31) as shown on diagram of typical transverse section, sheet 12 of this document.
- 2. Guidance for areas of measurement is indicated on the diagrams shown on sheet 14 of this document.
- 3. The single measurements recorded are to represent the average of multiple measurements.

Report on THICKNESS MEASUREMENT OF CARGO HOLD TRANSVERSE FRAMES

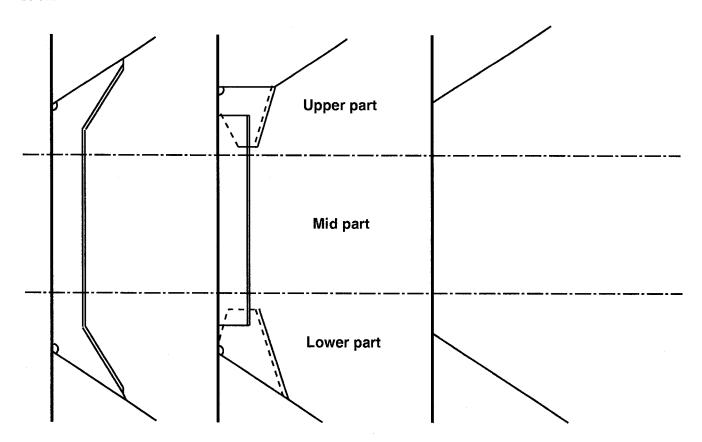
Class Identity No.

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	Surveyore Girmeture
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	O CANADA
	- I
<del>                                     </del>	
	+-
	Oncorber Circumstance

Ship's Name

#### **NOTES**

- 1. This report is to be used for recording the thickness measurement of:-
  - Cargo Hold Transverse Frames.
  - Structural item number 34 as shown on the diagram of typical transverse section, sheet 12 of this document.
- 2. Guidance for areas of measurement is indicated on the diagrams shown on sheet 14 of this document. The single measurements recorded are to represent the average of multiple measurements.
- 3. The location and pattern of measurements is to be indicated on the sketches of hold frames shown below.



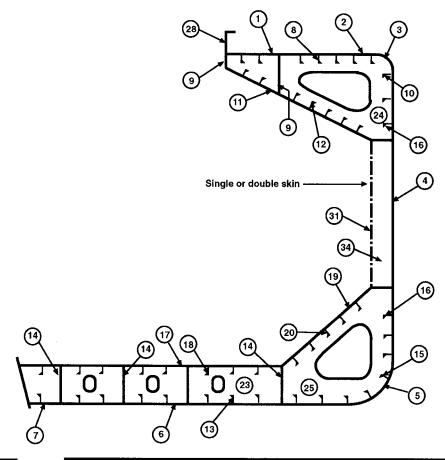
Typical transverse frames in cargo hold
Thickness gauging area

Non - typical transverse frame in cargo hold Thickness gauging area (A)

3165/01

#### **THICKNESS MEASUREMENT — BULK CARRIERS**

#### Bulk Carriers: Typical transverse section indicating longitudinal and transverse members



#### REPORT ON TM2-BC

- 1 Strength deck plating
- 2 Stringer plate
- 3 Sheerstrake
- 4 Side shell plating
- (5) Bilge plating
- 6 Bottom shell plating
- 7 Keel plate

- (8) Deck longitudinals
- Deck girders
- Sheerstrake longitudinals
- Topside tank sloping plating
- Topside tank sloping plating longitudinals
- (13) Bottom longitudinals
- (14) Bottom girders
- Bilge longitudinals

#### REPORT ON TM3-BC

- (16) Side shell longitudinals
- (17) Inner bottom plating
- (18) Inner bottom longitudinals
- (19) Hopper side plating
- 20) Hopper side longitudinals
- **1**100

#### **REPORT ON TM4-BC**

- 23) Double bottom tank floors
  - Topside tank transverses
- Hopper side tank transverses

#### REPORT ON TM6-BC

- (28) Hatch coamings
- 29 Deck plating between hatches
- Hatch covers
- Inner bulkhead plating

#### REPORT ON TM7-BC

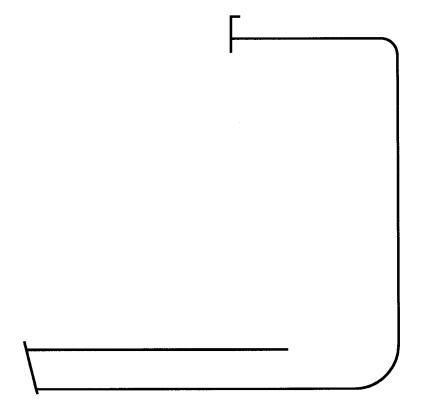
(34) Hold frames or diaphragms

Sheet 12

#### THICKNESS MEASUREMENT — BULK CARRIERS

**Bulk Carriers : Transverse section outline** 

To be used for longitudinal and transverse members where the typical Bulk Carrier section is not applicable.



#### REPORT ON TM2-BC

- 1) Strength deck plating
- 2 Stringer plate
- 3 Sheerstrake
- 4 Side shell plating
- 5 Bilge plating
- (6) Bottom shell plating
- (7) Keel plate

#### REPORT ON TM3-BC

- (8) Deck longitudinals
- 9 Deck girders
  10 Sheerstrake longitudinals
- 11) Topside tank sloping plating
- (12) Topside tank sloping plating longitudinals
- (13) Bottom longitudinals
- (14) Bottom girders
- (15) Bilge longitudinals

- (16) Side shell longitudinals
- (17) Inner bottom plating
- Inner bottom longitudinals
- 19 Hopper side plating
- <u>@</u> Hopper side longitudinals
- **②**

#### REPORT ON TM4-BC

Hopper side tank transverses

- 23 Double bottom tank floors
- Topside tank transverses

#### REPORT ON TM6-BC

- 28) Hatch coamings
- 29 Deck plating between hatches
- 30 Hatch covers
  31 Inner bulkhead
  32
  33 Inner bulkhead plating

#### REPORT ON TM7-BC

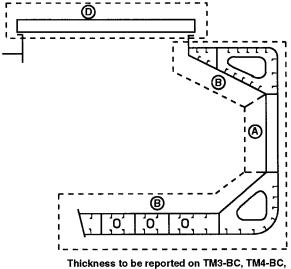
(34) Hold frames or diaphragms

Sheet 13

#### **Close-up Survey and Thickness Measurement Areas**

#### Typical transverse section

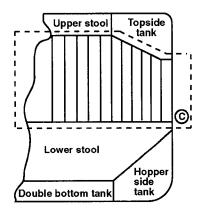
Areas (A), (B) and (D)



Thickness to be reported on TM3-BC, TM4-BC, TM6-BC and TM7-BC as appropriate

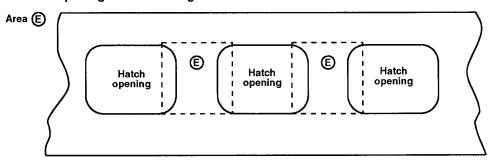
#### A cargo hold, transverse bulkhead

Area ©



Thickness to be reported on TM5-BC

## Typical areas of deck plating inside line of hatch openings between cargo hold hatches



Thickness to be reported on TM6-BC

Sheet 14

Appendix 1/C annex 1/C.2 Guidelines for Technical Assessment in Conjunction with Planning for Enhanced Surveys of Bulk Carriers Special Survey-Hull

### **Contents:**

#### 1. Introduction

#### 2. PURPOSE AND PRINCIPLES

- 2.1 Purpose
- 2.2 Minimum Requirements
- 2.3 Timing
- 2.4 Aspects to be Considered

#### 3. TECHNICAL ASSESSMENT

- 3.1 General
- 3.2 Methods
- 3.2.1 Design Details
- 3.2.2 Corrosion3.2.3 Locations for Close-up Survey and Thickness Measurement

#### REFERENCES

# ANNEX 1/C.2 Guidelines for Technical Assessment in Conjunction with Planning for Enhanced Surveys of Bulk Carriers Special Survey-Hull

#### 1.0 Introduction

These guidelines contain information and suggestions concerning technical assessments which may be of use in conjunction with the planning of enhanced special surveys of bulk carriers. As indicated in 1/C.5.1.5 of Appendix 1/C, "Hull Surveys of Bulk Carriers," the guidelines are a recommended tool which may be made mandatory by the Bureau, when considered necessary and appropriate, in conjunction with the preparation of the required Survey Plan.

#### 2.0 Purpose and Principles

#### 2.1 Purpose

The purpose of the technical assessments described in these guidelines is to assist in identifying critical structural areas, nominating suspect areas and in focusing attention on structural elements or areas of structural elements which may be particularly susceptible to, or evidence a history of, wastage or damage. This information may be useful in nominating locations, areas, holds and tanks for thickness measurement, close-up survey and tank testing.

#### 2.2 Minimum Requirements

However, these guidelines may not be used to reduce the requirements pertaining to thickness measurement, close-up survey and tank testing contained in Tables 1/C.1, 1/C.2 and paragraph 1/C.2.7, respectively, of Appendix 1/C; which are, in all cases, to be complied with as a minimum.

#### 2.3 Timing

As with other aspects of survey planning, the technical assessments described in these guidelines should be worked out by the Owner or operator in cooperation with the Classification Society well in advance of the commencement of the Special Survey, i.e., prior to commencing the survey and normally at least 12 to 15 months before the survey's completion due date.

#### 2.4 Aspects to be Considered

Technical assessments, which may include quantitative or qualitative evaluation of relative risks of possible deterioration, of the following aspects of a particular ship may be used as a basis for the nomination of holds, tanks and areas for survey:

• Design features such as stress levels on various structural elements, design details and extent of use of high tensile steel.

- Former history with respect to corrosion, cracking, buckling, indents and repairs for the particular ship as well as similar vessels, where available.
- Information with respect to types of cargo carried, protection of tanks, and condition of coating, if any, of holds and tanks.

Technical assessments of the relative risks of susceptibility to damages or deterioration of various structural elements and areas should be judged and decided on the basis of recognized principles and practices, such as may be found in IACS publication "Bulk Carriers: Guidelines for Surveys, Assessment and Repair of Hull Structure," (Ref. 4).

#### 3.0 Technical Assessment

#### 3.1 General

There are three basic types of possible failure which may be the subject of technical assessment in connection with planning of surveys; corrosion, cracks and buckling. Contact damages are not normally covered by the survey plan since indents are usually noted in survey reports and assumed to be dealt with as a normal routine by Surveyors.

Technical assessments performed in conjunction with the survey planning process, should in principle be carried out as shown schematically in Figure 1. The approach is based on an evaluation of experience and knowledge basically related to:

- Design
- Corrosion

The design should be considered with respect to structural details which may be susceptible to buckling or cracking as a result of vibration, high stress levels or fatigue.

Corrosion is related to the ageing process, and is closely connected with the quality of corrosion protection at newbuilding, and subsequent maintenance during the service life. Corrosion may also lead to cracking and/or buckling.

#### 3.2 Methods

#### 3.2.1 Design Details

Damage experience related to the ship in question and similar ships, where available, is the main source of information to be used in the process of planning. In addition, a selection of structural details from the design drawings should be included.

Typical damage experience to be considered will consist of:

- Number, extent, location and frequency of cracks.
- Location of buckles.

This information may be found in the survey reports and/or the Owner's files, including the results of the Owner's own inspections. The defects should be analyzed, noted and marked on sketches.

In addition, general experience should be utilized. For example, Figure 2 shows typical locations in bulk carriers which experience has shown may be susceptible to structural damage. Also, reference should be made to IACS's "Bulk Carriers: Guidelines for Survey, Assessment and Repair," (Ref. 4) which contains a catalogue of typical damages and proposed repair methods for various bulk carrier structural details.

Such figures should be used together with a review of the main drawings, in order to compare with the actual structure and search for similar details which may be susceptible to damage. An example is shown in Figure 3.

The review of the main structural drawings, in addition to using the above mentioned figures, should include checking for typical design details where cracking has been experienced. The factors contributing to damage should be carefully considered.

The use of high tensile steel (HTS) is an important factor. Details showing good service experience where ordinary, mild steel has been used may be more susceptible to damage when HTS, and its higher associated stresses, are utilized. There is extensive and, in general, good experience, with the use of HTS for longitudinal material in deck and bottom structures. Experience in other locations, where the dynamic stresses may be higher, is less favorable, e.g. side structures.

In this respect, stress calculations of typical and important components and details, in accordance with the latest Rules or other relevant methods, may prove useful and should be considered.

The selected areas of the structure identified during this process should be recorded and marked on the structural drawings to be included in the Survey Plan.

#### 3.2.2 Corrosion

In order to evaluate relative corrosion risks, the following information is generally to be considered:

- Usage of Tanks, Holds and Spaces
- Condition of Coatings

- Condition of Anodes
- Cleaning Procedures
- Previous Corrosion Damage
- Ballast use and time for Cargo Holds
- Risk of Corrosion in Cargo Holds and Ballast Tanks
   Location of Ballast Tanks Adjacent to Heated Fuel
- Oil Tanks

Ref. 3 gives definitive examples which can be used for judging and describing coating condition, using typical pictures of conditions.

For bulk carriers, Ref. 4 should be used as the basis for the evaluation, together with relevant information on the age of the ship and the anticipated condition of the ship as derived from the information collected in order to prepare the Survey Plan.

The various tanks, holds and spaces should be listed with the corrosion risks nominated accordingly.

**3.2.3** Locations for Close-up Survey and Thickness Measurement

On the basis of the table of corrosion risks and the evaluation of design experience, the locations for initial close-up survey and thickness measurement (sections) may be nominated.

The sections subject to thickness measurement should normally be nominated in tanks, holds and spaces where corrosion risk is judged to be the highest.

The selection of tanks, holds and spaces for close-up survey should, initially, be based on highest corrosion risk, and should always include ballast tanks. The principle for the selection should be that the extent is increased by age or where information is insufficient or unreliable.

#### References

- IACS Unified Requirements Z10.2, "Hull Surveys of Bulk Carriers."
- TSCF, "Guidance Manual for the Inspection and Condition Assessment of Tanker Structures."
- 3. TSCF, "Condition Evaluation and Maintenance of Tanker Structures."
- 4. IACS, "Bulk Carriers: Guidelines for Surveys, Assessment and Repair of Hull Structures."

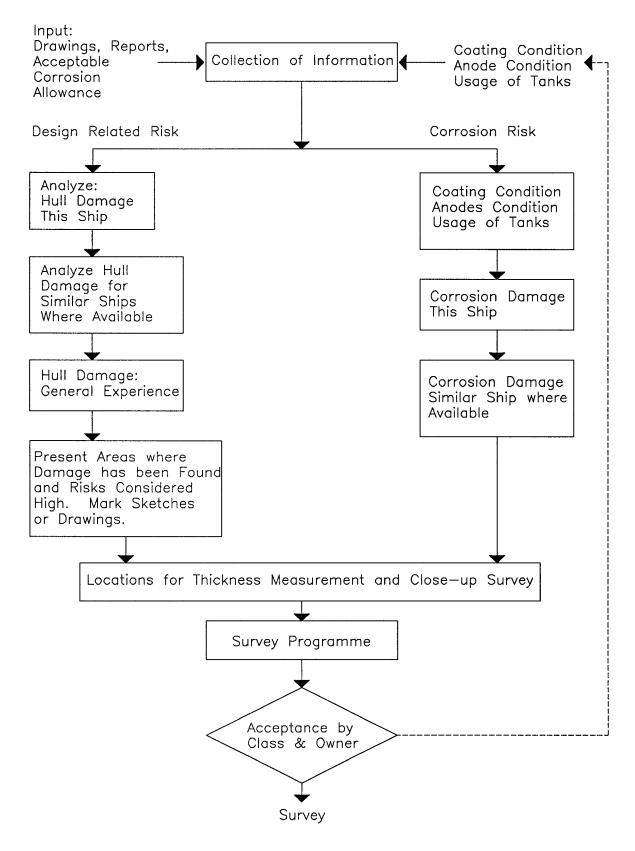


FIGURE 1: TECHNICAL ASSESSMENT AND THE SURVEY PLANNING PROCESS

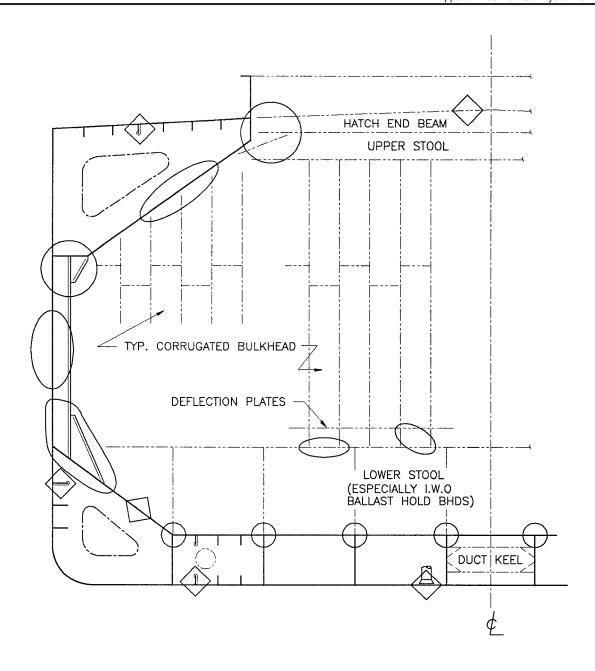
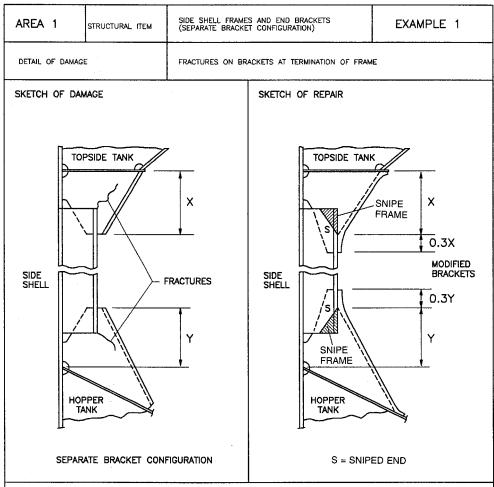


FIGURE 2: TYPICAL LOCATIONS SUSCEPTIBLE TO STRUCTURAL DAMAGE OR CORROSION



NOTES ON POSSIBLE CAUSE OF DAMAGE/REPAIR

- 1. THIS TYPE OF DAMAGE IS DUE TO STRESS CONCENTRATION.
- 2. FOR SMALL FRACTURES, E.G., HAIRLINE FRACTURES, THE FRACTURE CAN BE "VEED" OUT, WELDED UP, GROUND AND EXAMINED BY NOT FOR FRACTURES.
- 3. FOR LARGER/SIGNIFICANT FRACTURES, CONSIDERATION IS TO BE GIVEN TO CROPPING AND PARTLY RENEWING/RENEWING THE FRAME BRACKETS. IF RENEWING THE BRACKETS, ENDS OF FRAMES CAN BE SNIPED TO SOFTEN THEM.
- 4. IF LEFT PRUDENT, SOFT TOES ARE TO BE INCORPORATED AT THE BOUNDARIES OF THE BRACKET TO THE WING TANKS.
- 5. ATTENTION TO BE GIVEN TO THE STRUCTURE IN WING TANKS IN WAY OF THE EXTENDED BRACKET ARM. I.E., REINFORCEMENT PROVIDED IN LINE WITH THE BRACKET ARM.

# Part 1 APPENDIX 1/D Hull Surveys of Chemical Tankers

#### Foreword

It should be noted that this Appendix is in adition to the requirements in other parts of the Rules including those in Part 1 Section 3 — "Surveys after Construction".

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#### **Hull Surveys of Chemical Tankers**

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## Part 1 APPENDIX 1/D Hull Surveys of Chemical Tankers

#### 1/D.1. General

1/D.1.1 Application

**1/D.1.1.1** These requirements apply to hull surveys after construction of all self-propelled chemical tankers.

**1/D.1.1.2** These requirements apply to surveys of hull structure and piping systems in way of cargo tanks, pump rooms, cofferdams, pipe tunnels, void spaces within the cargo area and all ballast tanks. These requirements are additional to the requirements elsewhere in the Rules. The requirements are not applicable for independent tanks on deck.

**1/D.1.1.3** These requirements contain the extent of examination, thickness measurements and tank testing. The survey will be expanded when substantial corrosion and/or structural defects are found and will include additional Close-up Survey when necessary.

#### 1/D.1. Definitions

**1/D.1.2-1** A *Chemical Tanker* is a ship which is constructed or adapted and used for the carriage in bulk of any liquid product listed in Table 5/4B.17.

**1/D.1.2.1** A *Ballast Tank* is a tank which is used for salt water ballast and includes segregated ballast tanks, ballast double bottom spaces and peak tanks. A tank which is used for both cargo and ballast will be treated as a ballast tank when substantial corrosion has been found in that tank.

**1/D.1.2.2** An *Overall Survey* is a survey intended to report on the overall condition of the hull structure and to determine the extent of additional Close-up Surveys.

1/D.1.2.3 A *Close-up Survey* is a survey where the details of structural components are within the close visual inspection range of the Surveyor, i.e. normally within hand's reach.

1/D.1.2.4 A *Transverse Section* includes all longitudinal members such as plating, longitudinals and girders at the deck, side, bottom, inner bottom and longitudinal bulkheads

**1/D.1.2.5** Representative Tanks are those which are expected to reflect the condition of other tanks of similar type and service and with similar corrosion prevention systems. When selecting representative tanks account should be taken of the service and repair history onboard and identifiable critical and/or suspect areas.

**1/D.1.2.6** Suspect Areas are locations showing substantial corrosion and/or are considered by the Surveyor to be prone to rapid wastage.

1/D.1.2.7 Substantial Corrosion is an extent of corrosion such that assessment of corrosion pattern indicates a wastage in excess of 75% of the allowable margins, but within the acceptable limits.

Note: Wastage allowances may be found in "Guide for Preparation for Special Survey".

1/D.1.2.8 Corrosion Prevention System is normally to be a full hard coating which may or may not be supplemented by anodes. Other coating systems may be considered acceptable as alternatives provided that they are ap-

plied in compliance with the manufacturer's specification and properly maintained.

Soft Coatings—Where soft coatings have been applied, safe access is to be provided for the Surveyor to verify the effectiveness of the coating and to carry out an assessment of the conditions of the internal structures which may include spot removal of the coating. When safe access cannot be provided, the soft coating is to be removed.

**1/D.1.2.9** *Coating Condition* is defined as follows:

GOOD condition with only minor spot rusting.

FAIR condition with local breakdown at edges of stiffeners and weld connections and/or light rusting over 20% or more of areas under consideration, but less than as defined for POOR condition.

POOR condition with general breakdown of coating over 20% or more of areas or hard scale at 10% or more of areas under consideration.

1/D.1.2.10 Critical Structural Areas are locations which have been identified from calculations to require monitoring or from the service history of the subject ship or from similar or sister ships to be sensitive to cracking, buckling or corrosion which would impair the structural integrity of the ship.

**1/D.1.2.11** Cargo area is that part of the ship that contains cargo tanks, slop tanks and cargo pump-rooms; including pump-rooms, cofferdams, ballast, or void spaces adjacent to cargo tanks or slop tanks; and also deck areas throughout the entire length and breadth of the part of the ship over the above-mentioned spaces. Where independent tanks are installed in hold spaces, cofferdams, ballast or void spaces at the after end of the aftermost hold space or at the forward end of the forwardmost hold space are excluded from the cargo area.

#### 1/D.1. Scope of Surveys

**1/D.1.3.1** Prior to inspection the Surveyor is to examine the completeness of documentation on board, and its contents as a basis for the Survey.

1/D.1.3.2 When an annual, intermediate or special survey results in the identification of significant corrosion or of significant structural defects which, in the opinion of the Surveyor, will impair the structural integrity of the ship, then remedial action, in consultation with the Bureau should be agreed and implemented before the ship continues in service.

#### 1/D.2 Special Survey

#### 1/D.2.1 General

**1/D.2.1.1** The Special Survey may be commenced at the fourth Annual Survey and be progressed with completion by the fifth anniversary date.

1/D.2.1.2 As part of the preparation for the Special Survey, the thickness measurement and Survey Program should be dealt with in advance of the Special Survey. The thickness measurements taken during or after the fourth Annual Survey will be credited towards the Special Survey. 1/D.2.1.3 The Special Survey is to include, in addition to the requirements of the Annual Survey, examination tests and checks of sufficient extent to ensure that the hull and related piping are in a satisfactory condition and are fit for their intended purpose for the next five-year period subject to proper maintenance and operation and to periodical surveys being carried out at the due dates.

1/D.2.1.4 All cargo tanks, ballast tanks, pumprooms, pipe tunnels, cofferdams and void spaces bounding cargo tanks, decks and outer hull are to be examined. This examination is to be supplemented by thickness measurement and testing as deemed necessary, to ensure that the structural integrity remains effective. The examination is to be sufficient to discover substantial corrosion, significant deformation, fractures, damages or other structural deterioration.

1/D.2.1.5 All piping systems within the above tanks and spaces are to be examined and operationally tested under working conditions to ensure that tightness and condition remain satisfactory. Special attention is to be given to any ballast piping in cargo tanks and any cargo piping in ballast tanks and void spaces.

#### 1/D.2.2 Drydock Survey

1/D.2.2.1 A survey in drydock is to be a part of the Special Survey.

#### 1/D.2.3 Tank Protection

**1/D.2.3.1** (1998) Where provided, the condition of coating or corrosion prevention system of cargo tanks and ballast tanks is to be examined.

Tanks used for salt water ballast where a protective coating is found in POOR condition as defined in 1/D.1.2.9 and the owners or their representatives elected not to restore the coating, where soft coating has been applied, or where a protective coating has not been applied are to be internally examined at each subsequent Annual Survey.

Where extensive areas of wastage are found, thickness measurements are to be carried out and renewals made when wastage exceeds allowable margins.

#### 1/D.2.4 Extent of Overall and Close-up Survey

1/D.2.4.1 An Overall Survey of all tanks and spaces is to be carried out at Special Survey. The survey of stainless steel tanks may be carried out as an Overall Survey supplemented by Close-up Survey as deemed necessary by the Surveyor. For fuel oil tanks the necessity for the Overall Survey is to be determined based on the ship's age.

**1/D.2.4.2** The requirements for Close-up Surveys at Special Survey are given in Table 1/D.1.

1/D.2.4.3 The Surveyor may extend the Close-up Survey as deemed necessary, taking into account the maintenance of the tanks under survey, the condition of the corrosion prevention system, with particular attention being given to the following situations:

 Tanks having structural arrangements or details which have suffered defects in similar tanks or on similar ships according to available information; b) In tanks which have structures approved with reduced scantlings due to an approved corrosion control system.

**1/D.2.4.4** For areas in tanks where coatings are found to be in GOOD condition as defined in 1/D.1.2.9, the extent of Close-up Surveys according to Table 1/D.1 may be specially considered.

#### 1/D.2.5 Extent of Thickness Measurement

1/D.2.5.1 The requirements for thickness measurements at Special Survey are given in Table 1/D.2. The extent of thickness measurements of stainless steel hull structure may be specially considered, except for clad steel plating.

**1/D.2.5.2** (1998) Where substantial corrosion as defined in 1/D.1.2.7 is found, additional thickness measurements are to be carried out in accordance with Table 1/D.4.

**1/D.2.5.3** The Surveyor may require further thickness measurements as deemed necessary.

1/D.2.5.4 (1998) Where coatings are found to be in GOOD condition as defined in 1/D.1.2.9, the extent of thickness measurements of structural members subject to Close-up Surveys required according to Table 1/D.2 may be modified by the Surveyor. After Special Survey No. 2, modification of the extent of thickness measurements of structural members subject to Close-up Surveys is to be specially considered.

1/D.2.5.5 Transverse sections should be chosen from the section where the largest reductions are suspected to occur or are revealed from deck plating measurements.

1/D.2.5.6 In cases where two or three sections are to be measured, at least one should include a ballast tank within 0.5L amidships.

#### 1/D.2.6 Extent of Tank Testing

**1/D.2.6.1** The requirements for tank testing at Special Survey are given in Table 1/D.3.

1/D.2.6.2 Tanks are to be tested with a head of liquid to the top of access hatches for cargo tanks, or top of air pipes for ballast tanks.

#### 1/D.3 Intermediate Survey (1998)

1/D.3.1 The Intermediate Survey, which includes the following items, is to be carried out either at or between the second and third Annual Surveys.

- a) Weather decks—An examination as far as practical of cargo, crude oil washing, bunker, ballast, steam and vent piping systems as well as vent masts and headers. If upon examination there is any doubt as to the condition of the piping, the piping may be required to be pressure tested, thickness measured, or both.
- b) Overall, Close-up and Thickness Measurements—See Table 1/D.10 for requirements according to vessels age.

1/D.3.2 Tanks used for salt water ballast where a protective coating is found in POOR condition as defined in 1/D.1.2.9 and the Owners or their representatives elected not to restore the coating, where soft coating has been applied, or where a protective coating has not been applied, are to be internally examined at each subsequent Annual Survey.

**1/D.3.3** Where extensive areas of wastage are found, thickness measurements are to be carried out and renewals made when wastage exceeds allowable margins.

#### 1/D.4 Annual Survey

#### 1/D.4.1 General

**1/D.4.1.1** The survey is to consist of an examination for the purpose of ensuring, as far as practical, that the hull and piping are maintained in a satisfactory condition and is to take into account the following:

- a) service history,
- b) condition and extent of the corrosion prevention system of ballast tanks, and
- c) areas identified in the Survey Report Files.

#### 1/D.4.2 Examination of the Hull

**1/D.4.2.1** Examination of the hull plating and its closing appliances as far as can be seen (including 1/D.4.3 through 1/D.4.5).

**1/D.4.2.2** Examination of watertight penetrations as far as practicable.

#### 1/D.4.3 Examination of Weather Decks

**1/D.4.3.1** Examination of cargo tank openings including gaskets, covers, coamings and flame screens.

1/D.4.3.2 Examination of cargo tank pressure/vacuum valves and flame screens.

**1/D.4.3.3** Examination of flame screens on vents to all bunker, oily ballast and oily slop tanks.

**1/D.4.3.4** Examination of cargo, bunker and vent piping systems, including vent masts and headers.

## 1/D.4.4 Examination of Cargo Pump Rooms and Pipe Tunnels

1/D.4.4.1 Examination of all bulkheads for signs of chemical leakage or fractures and, in particular, the sealing arrangements of all penetrations of bulkheads.

**1/D.4.4.2** Examination of the condition of all piping systems and pipe tunnels.

#### 1/D.4.5 Examination of Ballast Tanks

1/D.4.5.1 (1998) Examination of ballast tanks when required as a consequence of the results of the Special Survey or Intermediate Survey. Where extensive areas of wastage are found, thickness measurements are to be carried out and renewals and/or repairs made when wastage exceeds allowable margins.

1/D.4.5.2 (1998) Examination of all ballast tanks where substantial corrosion is documented. Thickness measurements are to be taken to confirm condition of substantially corroded areas and renewals and/or repairs made when wastage exceeds allowable margins.

#### 1/D.5 Preparations for Special Survey

#### 1/D.5.1 Planning

1/D.5.1.1 Survey planning is to be worked out in advance of each Special Survey by the Owner in cooperation with the Bureau. The Survey Plan shall be in a written format. 1/D.5.1.2 The following documentation should be collected and consulted with a view to selecting tanks, areas, and structural elements to be examined:

- Survey status and basic ship information,
- Documentation on-board, as described in 1/D.6.2 and 1/D.6.3,
- Main structural plans, including information regarding use of higher strength steels,
- Relevant previous survey and inspection reports from both the Bureau and the Owner,
- Information regarding the use of the ship's tanks, typical cargoes and other relevant data,
- Information regarding corrosion protection level on the new building,
- Information regarding the relevant maintenance level during operation.

1/D.5.1.3 Survey planning is to account for and comply with the requirements of Tables 1/D.1, 1/D.2 and 1/D.3 for Close-up Survey, thickness measurement and tank testing, respectively, and is to consider relevant information including at least:

Basic ship information and particulars,

- Main structural plans, including information regarding use of higher strength steels, clad steel and stainless steel,
- Plan of tanks,
- List of tanks with information on use, protection and condition of coating,
- Conditions for survey (e.g., information regarding tank cleaning, gas freeing, ventilation, lighting, etc.),
- Provisions and methods for access to structures,
- Equipment for surveys,
- Tanks and areas selected for Close-up Survey (per Table 1/D.1),
- Structures selected for thickness measurement (per Table 1/D.2),
- Tanks selected for tank testing (per Table 1/D.3),
- Damage experience related to the vessel.

**1/D.5.1.4** The Bureau will advise the Owner of the maximum acceptable structural wastage allowances applicable to the vessel.

1/D.5.1.5 Guidelines for Technical Assessment in Conjunction with Planning for Enhanced Surveys of Chemical Tankers, contained in Annex 1/D.2, may be referred to in conjunction with the planning preparation.

Where considered necessary and appropriate by the Bureau, these Guidelines will be made mandatory.

#### 1/D.5.2 Conditions for Survey

1/D.5.2.1 The Owner is to provide the necessary facilities for a safe execution of the survey.

**1/D.5.2.2** Tanks and spaces are to be safe for access, i.e. gas freed, ventilated, etc.

1/D.5.2.3 Tanks and spaces are to be sufficiently clean and free from water, scale, dirt, oil residues, etc. to reveal significant corrosion, deformation, fractures, damages or other structural deterioration. In particular this applies to areas which are subject to thickness measurement.

1/D.5.2.4 Sufficient illumination is to be provided to reveal significant corrosion, deformation, fractures, damages or other structural deterioration.

#### 1/D.5.3 Access to Structures

**1/D.5.3.1** For Overall Survey, means are to be provided to enable the Surveyor to examine the tank structure in a safe and practical way.

**1/D.5.3.2** For Close-up Survey, one or more of the following means for access, acceptable to the Surveyor, is to be provided:

- a) permanent staging and passages through structures,
- b) temporary staging and passages through structures,
- c) lifts and moveable platforms,
- d) boats or rafts,
- e) other equivalent means.

1/D.5.4 Equipment for Survey

1/D.5.4.1 Thickness measurement is normally to be carried out by means of ultrasonic test equipment. The accuracy of the equipment is to be proven to the Surveyor as required.

1/D.5.4.2 One or more of the following fracture detection procedures may be required if deemed necessary by the Surveyor:

- a) radiographic equipment,
- b) ultrasonic equipment,
- c) magnetic particle equipment,
- d) dye penetrant.

#### 1/D.5.5 Survey at Sea or at Anchorage

**1/D.5.5.1** Survey at sea or at anchorage may be accepted provided the Surveyor is given the necessary assistance from the personnel onboard. Necessary precautions and procedures for carrying out the survey are to be in accordance with 1/D.5.1, .5.2, .5.3 and .5.4.

**1/D.5.5.2** A communication system is to be arranged between the survey party in the tank and the responsible officer on deck. This system must also include the personnel in charge of ballast pump handling if boats or rafts are used.

1/D.5.5.3 Explosimeter, oxygen-meter, breathing apparatus, life line and whistles are to be at hand during the survey. When boats or rafts are used, appropriate life jackets are to be available for all persons on board.

Boats or rafts are to have satisfactory residual buoyancy and stability even if one chamber is ruptured.

A safety check-list is to be provided.

**1/D.5.5.4** Surveys of tanks by means of boats or rafts may only be undertaken with the agreement of the Surveyor, who is to take into account the safety arrangements provided, including weather forecasting and ship response in reasonable sea conditions.

#### 1/D.6 Documentation on Board

#### 1/D.6.1 General

1/D.6.1.1 The Owner is to supply and maintain on board documentation as specified in 1/D.6.2 and 1/D.6.3, which should be readily available for the Surveyor.

**1/D.6.1.2** The documentation is to be kept on board for the lifetime of the ship.

#### 1/D.6.2 Survey Report File

**1/D.6.2.1** A Survey Report File is to be a part of the documentation on board consisting of:

- a) Reports of structural surveys,
- b) Condition Evaluation Report,
- c) Thickness measurement reports,
- d) Survey plan as noted in 1/D.5.1 until such time as the Special Survey has been completed.

**1/D.6.2.2** The Survey Report File is also to be available in the Owner's management office.

#### 1/D.6.3 Supporting Documents

**1/D.6.3.1** The following additional documentation is to be available on board:

- a) Main structural plans of cargo and ballast tanks,
- b) Previous repair history,
- c) Cargo and ballast history,
- d) Extent of use of inert gas plant and tank cleaning procedures,
- e) Inspections and actions taken by ship's personnel with reference to,
  - i structural deterioration in general
  - ii leakage in bulkheads and piping
  - *iii* condition of coating or corrosion protection, if any. A guidance for reporting is shown in Table 1/D.5.
- f) any other information that will help to identify critical structural areas and/or suspect areas requiring inspection.

#### 1/D.7. Procedures for Thickness Measurements

#### 1/D.7.1 General

1/D.7.1.1 Thickness measurements are to be carried out under the guidance of the Surveyor. Consideration may be given in special circumstances to accepting thickness measurements taken where a Surveyor was not in attendance.

## 1/D.7.2 Certification of Thickness Measurement Company

1/D.7.2.1 The thickness measurements are to be carried out by a qualified company certified by the Bureau according to principles stated in Table 1/D.7.

#### 1/D.7.3 Reporting

**1/D.7.3.1** A thickness measurement report is to be prepared and submitted to the attending Surveyor. The report is to give the location of measurements, the thickness measured as well as corresponding original thickness.

Furthermore, the report is to give the date when the measurements were carried out, type of measuring equipment, names of personnel and their qualifications and has to be signed by the operator. The thickness measurement report is to follow the principles as specified in Annex 1/D.1, for Thickness Measurements of Chemical Tankers.

**1/D.7.3.2** The Surveyor is to verify and countersign the thickness measurement report.

#### 1/D.8 Reporting and Evaluation of Survey

#### 1/D.8.1 Evaluation of Survey Report

1/D.8.1.1 The data and information on the structural condition of the vessel collected during the survey is to be evaluated for acceptability and continued structural integrity of the vessel.

#### 1/D.8.2 Reporting

**1/D.8.2.1** Principles for survey reporting are shown in Table 1/D.8.

1/D.8.2.2 A Condition Evaluation Report of the survey and results is to be issued to the Owner as shown in Table 1/D.9 and placed on board the vessel for reference at future surveys.

#### TABLE 1/D.1 Requirements for Close-up Survey of Chemical Tankers

	Number 1
	$(Age \le 5 \ years)$
1.	One complete transverse web frame ring including adjacent structural members in a ballast wing tank or ballast double hull tank.  [A]
2.	One deck transverse including adjacent deck structural members in a cargo wing tank. [B]

Special Periodical Survey

system and adjacent structural members -in one ballast tank in one cargo wing tank -in one cargo center tank

[D]

bulkhead including girder

3. Lower part of transverse

- Special Periodical Survey Number 2  $(5 < Age \le 10 \ years)$
- 1. All complete transverse web frame rings including adjacent structural members, side shell, and longitudinal bulkhead in a ballast wing tank or ballast double hull tank. [E]
- 2. One deck transverse including adjacent deck structural members in each of the remaining
  - ballast tanks, if any
  - in a cargo wing tank--in two cargo center tanks [B]
- 3. Both transverse bulkheads including girder system and adjacent structural members in a wing ballast tank or ballast double hull tank.
- 4. Lower part of transverse bulkhead including girder system and adjacent structural members
  - —in each remaining ballast tank
  - -in one cargo wing tank
  - in two cargo center tanks [D]

- Special Periodical Survey Number 3
  - $(10 < Age \le 15 \ years)$

Subsequent Special Periodical Surveys (Age > 15 years)

- 1. All complete transverse web frame rings including adjacent structural members, side shell, and longitudinal bulkhead
  - -in all ballast tanks —in a cargo wing tank [E]
- 2. One complete transverse web frame ring including adjacent structural members in each remaining cargo wing tank. [A]
- 3. One deck and bottom transverse including adjacent structural members in each cargo center tank.
- 4. All transverse bulkheads including girder and stiffener systems and adjacent members in all cargo and ballast tanks. [C]
- 5. Additional complete transverse web frame rings as considered necessary by the Surveyor.

- 1. All complete transverse web frame rings including adjacent structural members, side shell, and longitudinal bulkhead
  - -in all ballast tanks
  - —in a cargo wing tank [E]
- 2. One complete transverse web frame ring including adjacent structural members in each remaining cargo wing tank. [A]
- 3. One deck and bottom transverse including adjacent structural members in each cargo center tank.
- 4. All transverse bulkheads including girder and stiffener systems and adjacent members in all cargo and ballast tanks. [C]
- 5. Additional complete transverse web frame rings as considered necessary by the Surveyor.
- 6. Any additional tanks and structure as considered necessary by the Surveyor.

#### NOTES:

- 1. With reference to cargo and ballasting history and coating arrangements, tanks and holds should be selected for Close-up Surveys which will provide the best representative sampling of areas likely to be most exposed to the effects of corrosion, swash or stress concentrations.
- 2. Close-up Surveys are to include welded attachments. Where deck transverses are fitted on deck, they are to be included in closeup survey
- 3. For vessels of double hull construction, wing tank to include both side tank and double bottom, even if these tanks are separate.
- 4. Double hull tank includes double bottom and side tank even though these tanks are separate.
- 5. Refer to figures in Annex 1/D.1.
- [A] complete transverse web frame ring including adjacent structural members.
- [B] Deck transverse including adjacent deck structural members.
- [C] Transverse bulkhead compete including girder system and adjacent members.
- [D] Transverse bulkhead lower part including girder system and adjacent structural members.
- [E] complete tank including all tank boundaries and internal structure and external structure on deck in way of the tank.

#### TABLE 1/D.2 Requirements for Thickness Measurements at Special Survey of Chemical Tankers

Special Periodical Survey	Special Periodical Survey	Special Periodical Survey	Subsequent Special Periodical
Number 1	Number 2	Number 3	Surveys
$(Age \le 5 \ years)$	$(5 < Age \leq 10 \ years)$	$(10 < Age \le 15 \ years)$	(Age > 15 years)
1. One transverse section of deck plating for the full beam of the ship within amidships 0.5L (in way of a ballast tank, if any.)	1. All main deck plating within the amidships 0.5L or cargo area, whichever is longer.	1. All main deck plating within the amidships 0.5L or cargo area whichever is longer.	1. All main deck plating within the cargo area, all exposed main deck plating outside of cargo area, and all exposed 1st tier superstructure deck plating (poop, bridge and forecastle decks).
2. Measurement, for general assessment and recording of corrosion patterns, of structural members subject to Close-up Surveys.	2. One transverse section within the amidships 0.5L.	2. Two transverse sections within the amidships 0.5L.	2. A minimum of three transverse sections within the amidships 0.5L.
3. Suspect areas throughout the vessel.	3. Plating in two wind-and-water strakes outside the amid-ships 0.5L.	3. All plating in two wind- and-water strakes, port and starboard, full length.	3. All plating in two wind- and-water strakes, port and starboard, full length.
	4. Plating and stiffeners of transverse bulkheads and internals in forepeak and afterpeak tanks.	4. Plating and stiffeners of transverse bulkheads and internals in forepeak and afterpeak tanks.	4. Plating and stiffeners of transverse bulkheads and internals in forepeak and afterpeak tanks.
	5. Measurement, for general assessment and recording of corrosion patterns, of structural members subject to Close-up Surveys.	5. Measurement, for general assessment and recording of corrosion patterns, of structural members subject to Close-up Surveys.	5. All keel and bottom plating full length.
	6. Suspect areas throughout the vessel.	6. Suspect areas throughout the vessel.	6. Measurement, for general assessment and recording of corrosion patterns, of structural members subject to Close-up Surveys.
			7. Suspect areas throughout vessel.

#### **NOTES:**

- 1. Definition of transverse section (girth belt/belt). A transverse section includes all longitudinal members such as plating, longitudinals and girders at the deck, side, bottom, inner bottom and longitudinal bulkheads.
- 2. With reference to cargo/ballast history and arrangement and condition of coatings, tanks and specific thickness gauging locations should be selected which will provide the best representative sampling of areas likely to be most exposed to corrosion effects, i.e. typically in way of ballast tanks.
- $3. \ \ (1998) \, As \, noted \, in \, 1/D.2.5.4 \, where \, coatings \, are \, found \, in \, GOOD \, condition \, as \, defined \, in \, 1/D.1.2.9 \, the \, extent \, of \, thickness \, measurements$ of structural members in way of Close-up Surveys may be modified by the Surveyor. After Special Survey No. 2, modification of the extent of thickness measurements of structural members subject to Close-up Surveys is to be specially considered.
- 4. As Appendix 1/D requirements address all ballast tanks, Close-up surveys and gauging requirements apply to forepeak and afterpeak tanks allocated for ballast.

## TABLE 1/D.3 Requirements for tank testing at Special Survey of Chemical Tankers (see 1/3.22.3h)

 $AGE \le 5 YEARS$ 

 $5 < AGE \le 10 \text{ YEARS}$ 

 $10 < AGE \le 15 \text{ YEARS}$ 

AGE > 15 YEARS

- 1. All ballast tank boundaries
- Cargo tank boundaries facing ballast tanks, void spaces, pipe tunnels, fuel oil tanks, pump rooms or cofferdams
- 1. All ballast tank boundaries
- 2. Cargo tank boundaries facing ballast tanks, void spaces, pipe tunnels, fuel oil tanks, pump rooms or cofferdams
- 3. All cargo tank bulkheads which form the boundaries of segregated cargoes
- 1. All ballast tank boundaries
- 2. Cargo tank boundaries facing ballast tanks, void spaces, pipe tunnels, fuel oil tanks, pump rooms or cofferdams
- 3. All remaining cargo tank bulkheads
- 1. All ballast tank boundaries
- 2. Cargo tank boundaries facing ballast tanks, void spaces, pipe tunnels, fuel oil tanks, pump rooms or cofferdams
- 3. All remaining cargo tanks bulkheads

#### TABLE 1/D4a

Requirements for extent of thickness measurement at those areas of substantial corrosion. Special Survey of Chemical Tankers within the cargo tank length

#### **DOUBLE BOTTOM AND HOPPER STRUCTURE**

STRUCTURAL MEMBERS	EXTENT OF MEASUREMENT	PATTERN OF MEASUREMENT
1. Inner Bottom and Bottom plating	Suspect plate plus all adjacent plates. Measurements around and under all bell mouths and pump wells.	5 point pattern for each panel be- tween longitudinals over 1 meter length
2. Inner Bottom and Bottom Longitudinals	Three longitudinals where plates measured.	3 measurements in line across flange and 3 measurements on vertically web
3. Longitudinal girders or Transverse floors	Suspect plates	5 point pattern over about 1 square meter.
4. Watertight Bulkheads (WT Floors)	a) lower 1/3 of tank	a) 5 point pattern over about 1
	b) upper 2/3 of tank	square meter. b) 5 point pattern alternate plates over 1 square meter of plating
5. Web Frames	Suspect plate	5 point pattern

#### TABLE 1/D4b

Requirements for extent of thickness measurement at those areas of substantial corrosion. Special Survey of Chemical Tankers within the cargo tank length

#### **DECK STRUCTURE**

STRUCTURAL MEMBERS	EXTENT OF MEASUREMENT	PATTERN OF MEASUREMENT
1. Deck plating	Two bands across tank	Minimum of three measurements per plate per band
2. Deck Longitudinals	Minimum of 3 longitudinals in each of two bays	3 measurements in line vertically on webs, and 2 measurements on flange (if fitted).
3. Deck girders and brackets	At fore and aft transverse bulkhead, bracket toes and in center of tanks	Vertical line of single measurements on web plating with one measurement between each panel stiffener, or a minimum of three measurements. Two measurements across face flat. 5 point pattern on girder/bhd brackets.
4. Deck transverse webs	Minimum of two webs with measure- ments at middle and both ends of span	5 points pattern over about 2 square meter areas. Single measurements on face flat
5. Panel stiffening	Where available	Single measurements

Note: For tanks where substantial corrosion covers more than 20% of the deck surface, the whole deck structure including longitudinals and web frames above the tank should be thickness measured in accordance with above.

#### TABLE 1/D4c

Requirements for extent of thickness measurement at those areas of substantial corrosion. Special Survey of Chemical Tankers within the cargo tank length

#### SHELL AND LONGITUDINAL BULKHEADS

STRUCTURAL MEMBERS	EXTENT OF MEASUREMENT	PATTERN OF MEASUREMENT
Deckhead and bottom strakes, and strakes in way of stringer plat- forms	Plating between each pair of longitudinals in a minimum of 3 bays	Single measurement
2. All other strakes	Plating between every 3rd pair of longitudinals in same 3 bays	Single measurement
<ol><li>Longitudinals—deckhead and bottom strakes</li></ol>	Each longitudinal in same 3 bays	3 measurements across web and 1 measurement on flange
4. Longitudinals—all others	Every third longitudinal in same 3 bays	3 measurements across web and 1 measurement on flange
5. Longitudinals—bracket	Minimum of three at top middle and bottom of tank in same 3 bays	5 point pattern over area of bracket
6. Web frames and cross ties	3 webs with minimum of three locations on each web, including in way of cross tie connections	5 point pattern over about 2 square meter area, plus single measurements on web frame and cross tie face flats

#### TABLE 1/D4d

Requirements for extent of thickness measurement at those areas of substantial corrosion. Special Survey of Chemical Tankers within the cargo tank length

#### TRANSVERSE BULKHEADS AND SWASH BULKHEADS

STRUCTURAL MEMBERS	EXTENT OF MEASUREMENT	PATTERN OF MEASUREMENT
Deckhead and bottom strakes, and strakes in way of stringer plat- forms	Plating between pair of stiffeners at three locations—approx. 1/4, 1/2 and 3/4 width of tank	5 points pattern between stiffeners over 1 meter length
2. All other strakes	Plating between pair of stffeners at middle location	Single measurement
3. Strakes in corrugated bulkheads	Plating for each change of scantling at center of panel and at flange or fabricated connection	5 point pattern over about 1 square meter of plating
4. Stiffeners	Minimum of three typical stiffeners	For web, 5 point pattern over span between bracket connections (2 mea- surements across web at each bracket connection, and one at center of span). For flange, single measure- ments at each bracket toe and at cen- ter of span
5. Brackets	Minimum of three at top middle and bottom of tank	5 point pattern over areas of bracket
6. Deep webs and girders	Measurements at toe of bracket and at center of span	For web, 5 point pattern over about 1 square meter. 3 measurements across face flat.
7. Stringer platforms	All stringers with measurements at both ends and middle	5 point pattern over 1 square meter of area plus single measurements near bracket toes and on face flats.

#### TABLE 1/D5

		OWNERS INSPEC	CTION REPORT-	–Structural Cor	ndition	
		For T	Cank No			
Grade of Stee	el;				Side: Long. Bhd	:
Elements Other	Cracks	Buckles	Corrosion	Coating cond.	Pitting	Mod. /Rep.
Deck:						
Bottom:						
Side:						
Long. Bulkheads:						
Transv. Bulkheads:						
Repairs carrie	ed out due to:					
Thickness me Results in Ge	asurements car neral:	ried out, dates:				
Overdue Surv	eys:					
Outstanding (	Conditions of cl	ass:				
Comments:						

TABLE 1/D.6

No Text

#### TABLE 1/D7

## Procedures for Certification of Firms Engaged in Thickness Measurement of Hull Structures

#### 1. Application

This guidance applies for certification of the firms which intend to engage in the thickness measurement of hull structures of the vessels.

#### 2. Procedures for Certification

#### (1) Submission of Documents:

Following documents are to be submitted to the society for approval;

- a) Outline of firms, e.g. organization and management structure.
- b) Experiences of the firms on thickness measurement inter alia of hull structures of the vessels.
- c) Technicians careers, i.e. experiences of technicians as thickness measurement operators, technical knowledge of hull structure etc. Operators, should be qualified according to a recognized industrial NDT Standard.
- Equipment used for thickness measurement such as ultra-sonic testing machines and its maintenance/calibration procedures.
- e) A guide for thickness measurement operators.
- f) Training programmes of technicians for thickness measurement.
- g) Measurement record format in accordance with IACS Recommended Procedures for Thickness Measurement.

#### (2) Auditing of the firms:

Upon reviewing the documents submitted with satisfactory results, the firm is audited in order to ascertain that the firm is duly organized and managed in accordance with the documents submitted, and eventually is capable of conducting thickness measurement of the hull construction of the ships.

(3) Certification is conditional on an onboard demonstration at thickness measurement as well as satisfactory reporting.

#### 3. Certification

- (1) Upon satisfactory result of both the audit of the firm in 2(2) and the demonstration tests in 2(3) above, the Society will issue a Certificate of Approval as well as a notice to the effect that the thickness measurement operation system of the firm has been certified by the Society.
- (2) Renewal/endorsement of the Certificate is to be made at intervals not exceeding 3 years by verification that original conditions are maintained.

#### 4. Information of any alteration to the Certified Thickness Measurement Operation System

In case, where any alteration to the certified thickness measurement operation system of the firm is made, such an alteration is to be immediately informed to the Society. Re-audit is made where deemed necessary by the Society.

#### 5. Cancellation of Approval

Approval may be cancelled in the following cases:

- (1) Where the measurements were improperly carried out or the results were improperly reported.
- (2) Where the Society's surveyor found any deficiencies in the approved thickness measurement operation systems of the firm.
- (3) Where the firm failed to inform of any alteration in 4 above to the Society.

#### TABLE 1/D8 Reporting Principles

Reporting forms are to be in accordance with the attachments. In principle, the following content of reports for chemical tanker structures is to be included as applicable for the type of survey:

#### 1.0 Type of Survey (Special Survey, Intermediate Survey, Annual Survey, Other)

#### 2.0 **Extent of the Survey**

- Identification of overall surveyed tanks. 2.1
- 2.2 Where in each tank Close-up Survey has been carried out, and means of access.
- Identification of tanks and location in tanks to be given with respect to the thickness measurements carried out. 2.3
- 2.4 Identification of pressure tested tanks.

#### 3.0 **Results of the Survey**

- Coating condition of each tank (if applicable). Identify tanks with anodes. 3.1
- 3.2 Structural condition of each tank:
  - Identified tank found in satisfactory condition.

Otherwise identify findings which, should be corrected or recorded, such as:

- Corrosion Structure members
  - Type of corrosion (Pitting, General)Extent
- Cracks (location)
- Buckling (location)
- Indents (location)

The narrative report may be supplemented by sketched/photos of damages/repairs.

Thickness measurement report endorsed by the attending class surveyor. 3.3

#### Actions to possible findings: 4.0

- Repair in identified tanks
  - Structural member
  - Repair method
  - Repair extent
- 4.2 Recorded findings considered not to necessitate repairs.

Memoranda for future inspections and thickness measurements to be given, e.g. for areas found as suspect with respect to corrosion (ref. item 1.2-7).

4.3 Condition of Class (Recommendations)

#### TABLE 1/D9a IACS Unified Requirements for Enhanced Surveys Executive Hull Summary

Issued upon Completion of Special Survey

GENERAL PARTICULARS			
SHIPS NAME:	(	CLASS IDENTIFY NUMBER:	
	I	MO IDENTIFY NUMBER:	
PORT OF REGISTRY:	ı	NATIONAL FLAG:	
DEADWEIGHT (M. TONNES):	1	GROSS TONNAGE: NATIONAL: ITC (69):	
DATE OF BUILD:	(	CLASSIFICATION NOTATION:	
DATE OF MAJOR CONVERSION:			
TYPE OF CONVERSION:			
b) A summary of the survey is atta	·	y the undersigned and found to be satisfactory  ns on [date]	
Executive Summary Report completed by:	Name Signature	Title	
OFFICE	DATE	·	
Executive Summary Report verified by:	Name Signature	<u>Title</u>	
OFFICE	DATE		
Attached reports and documents: 1) 2) 3) 4) 5)			

#### TABLE 1/D9b **Executive Hull Summary**

A) Ref. Table IX (i) General Requirements:

B) Report Review: Where and how survey was done

C)Extent (Which tanks) Close-up Survey:

D) Thickness

Reference to Thickness Measurement report measurements

Summary of where measured

Separate form indicating the tanks/areas with Substantial Corrosion, and

corresponding
• Thickness diminution

• Corrosion pattern

Separate form indicating: Location of coating/anodes E) Tank Protection

Condition of coating (if applicable)

Identification of tanks/areas F) Repairs

Condition of Class/ G)

Recommendations:

H) Memoranda: Acceptable defects

Any points of attention for future surveys, e.g. for Suspect Areas.

Extended Annual/Intermediate Survey due to coating breakdown

I) Conclusion Statement on evaluation/verification of survey report

#### TABLE 1/D9c **Extract of Thickness Measurements**

Reference is made to the thickness measurements report:

1) Position of substantially corroded Tanks/Areas	Thickness dimunition (%)	2) Corrosion pattern	Remarks: e.g. Ref. Attached. sketches

#### Remarks

1) Substantial corrosion, i.e. 75–100% of acceptable margins wasted

2) P = Pitting C = Corrosion in General

## TABLE 1/D9d Tank Protection

1) Tank Nos.	2) Tank protection	3) Coating condition	Remarks:

Remarks

1)

All segregated ballast tanks and combined cargo/ballast tanks to be listed.

2)

C = Coating A = Anodes NP = No Protection

3)

Coating condition according to the following standard

GOOD condition with only minor spot rusting.

FAIR condition with local breakdown at edges of stiffeners and weld connections and/or light rusting over

20% or more of areas under consideration, but less than as defined for POOR condition.

 $POOR \qquad condition \ with \ general \ breakdown \ of \ coating \ over \ 20\% \ or \ more \ of \ areas \ or \ hard \ scale \ at \ 10\% \ or \ more$ 

of areas under consideration.

If coating condition "POOR" is given, extended annual surveys are to be introduced. This is to be noted in part G) of the Executive Hull Sumary.

TABLE 1/D.10 (1998)

## Overall Survey, Close-Up Survey and Thickness Measurement Requirements at Intermediate Survey of Chemical Carriers

$5 < AGE \le 10$	10 . ACE < 15	ACE . 15
5 < AGE ≤ 10	$10 < AGE \le 15$	AGE > 15
Overall Survey <sup>1</sup> of at least three (3) representative ballast tanks selected by the Surveyor.  Where no protective coating is found; where protective coating is in POOR condition; or where corrosion or other defects are found; the Overall Survey is to be extended to other ballast tanks of the same type.	Overall Survey <sup>1</sup> of all ballast and combined cargo/ballast tanks.	Overall Survey <sup>1</sup> of all ballast and combined cargo/ballast tanks.
	Close-up Survey <sup>2,3</sup> of ballast tanks per requirements of previous Special Survey.	Close-up Survey <sup>2,3</sup> of ballast tanks per requirements of previous Special Survey.
	Overall Survey of at least three (3) representative cargo tanks <sup>4</sup> .	Overall Survey of at least three (3) representative cargo tanks <sup>4</sup> .
	Close-up Survey <sup>2,3</sup> of at least two (2) combined cargo/ballast tanks to the extent considered necessary based on record of previous Special Survey and repair history.	Close-up Survey <sup>2,3</sup> of at least two (2) combined cargo/ballast tanks to the extent considered necessary based on record of previous Special Survey and repair history.
		Close-up Survey <sup>2,3</sup> of at least one (1) additional cargo tank to the extent considered necessary based on record of previous Special Survey and repair history.
Thickness measurements of suspect areas, as defined by 1/D.1.2.6, identified at previous Special Survey.	Thickness measurements of suspect areas, as defined by 1/D.1.2.6, identified at previous Special Survey.	Thickness measurements of suspect areas, as defined by 1/D.1.2.6, identified at previous Special Survey.
Where substantial corrosion, as defined by 1/D.1.2.7, is found, additional thickness measurements in accordance with Table 1/D.4.	Where substantial corrosion, as defined by 1/D.1.2.7, is found, additional thickness measurements in accordance with Table 1/D.4.	Where substantial corrosion, as defined by 1/D.1.2.7, is found, additional thickness measurements in accordance with Table 1/D.4.
Thickness measurements as considered necessary by the Surveyor.	Thickness measurements as considered necessary by the Surveyor.	Thickness measurements as considered necessary by the Surveyor.

- 1 If no visible structural defects are found, the examination may be limited to a verification that the protective coating remains effective.
- 2 For areas in tanks (ballast, cargo or combined ballast/cargo) where coatings are found in GOOD condition, as defined by 1/D.1.2.9, the extent of Close-up Survey may be specially considered.
- 3 The extent of Close-up Surveys may be extended as stated in 1/D.2.4.3.
- 4 In addition to the structure, fittings such as valves and instrumentation is to be subject to a general examination.

ANNEX 1/D.1 PROCEDURES FOR THICKNESS MEASUREMENTS OF CHEMICAL TANKERS

### **Contents**

Sheet 1	_	Contents
Sueet 1		Contents

Sheet 2 — Instructions

Sheet 3 — General particulars

### REPORTS

- Sheet 4 Report TM1-T for recording the thickness measurement of all deck plating, all bottom shell plating and side shell plating.
- Sheet 5 Report TM2-T (i) for recording the thickness measurement of shell and deck plating at transverse sections strength deck and sheerstrake plating.
- Sheet 6 Report TM2-T (ii) for recording the thickness measurement of shell and deck plating at transverse sections shell plating.
- Sheet 7 Report TM3-T for recording the thickness measurement of longitudinal members at transverse sections.
- Sheet 8 Report TM4-T for recording the thickness measurement of transverse structural members.
- Sheet 9 Report TM5-T for recording the thickness measurement of W.T./O.T. transverse bulkheads.
- Sheet 10 Report TM6-T for recording the thickness measurement of miscellaneous structural members.

### GUIDANCE

- Sheet 11 Chemical tanker typical transverse sections. The diagram includes details of the items to be measured and the report forms to be used.
- Sheet 12 Transverse section outline. This diagram may be used for those ships where the diagrams on sheet 11 are not suitable.
- Sheet 13 Chemical tanker diagrams showing the typical longitudinal members in a transverse section.
- Sheet 14 Transverse sections of chemical tankers showing typical areas for thickness measurement in association with close-up survey requirements.

### ANNEX 1/D.1 PROCEDURES FOR THICKNESS MEASUREMENTS OF CHEMICAL TANKERS

- 1. This document is to be used for recording thickness measurements as required by Table 1/D.2 and 1/D.4 of the Appendix 1/D.
- 2. Reporting forms TM1-T, TM2-T, TM3-6, TM4-T, TM5-T and TM6-7 (Sheets 4–10) are to be used for recording thickness measurements.
- 3. The remaining Sheets 11–17 are guidance diagrams and notes relating to the reporting forms and the procedure for thickness measurements.

### **General Particulars**

Ships name:-						
IMO number						
ABS identification number						
Port of registry:-						
Gross tons:-						
Deadweight:-						
Date of build:-						
Classification society:-						
Name of Company performing thickness measurement:-						
Thickness measurement company certified by:-						
Certificate No.						
Certificate valid from to						
Place of measurement:-						
First date of measurement:-						
Last date of measurement:-						
Special survey/intermediate survey due:-*						
Details of measurement equipment:-						
Qualification of operator:-						
Report Number:-		consisting of	Sheets			
Name of operator:-	Name of surveyor:-					
Signature of operator:-	Signature of surveyor:-					
Company official stamp:-	Classification Society					
	Official Stamp:-					
*Delete as appropriate.						

Report on THICKNESS MEASUREMENT of ALL DECK PLATING, ALL BOTTOM SHELL PLATING or SIDE SHELL PLATING\*

(\* delete as appropriate) TM1-T

Class Identity No.

Ship's Name .....

Report No.

						-									
PLATE	o Z	Org			Forward Reading	Reading		·			Aft Reading	ading			Mean Diminution
POSITION	or	th,	Gai	Gauged	Diminution P	ition P	Dimin	Diminution S	Gauged	ged	Diminution P	ition P	Diminution S	ntion S	%
	Letter	mm	Ь	S	mm	%	mm	%	Ь	S	mm	%	mm	%	Ь
12th forward															
11th															
10th															
9th															
8th															
7th															
6th															
5th															
4th															
3rd															
2nd															
lst															
Amidships															
1st aft															
2nd															
3rd															
4th															
5th															
6th															
7th												-			
8th															
9th															
10th															.
11th															
12th										-					

- 1. This report is to be used for recording the thickness measurement of:
  - A. All strength deck plating within the cargo area.
  - B. All keel, bottom shell plating and bilge plating within the cargo area.
  - C. Side shell plating including selected wind and water strakes outside 0.5L amidships.
- 2. The strake position is to be clearly indicated as follows:
  - 2.1 For strength deck indicate the number of the strake of plating inboard from the stringer plate.
  - 2.2 For bottom plating indicate the number of the strake of plating outboard from the keel plate.
  - 2.3 For side shell plating give number of the strake of plating below sheerstrake and letter as shown on shell expansion.

Measurements are to be taken at the forward and aft areas of all plates and where plate cross ballast/cargo tank boundaries separate measurements for the area of plating in way of each type of tank are to be recorded.

The single measurements recorded are to represent the average of multiple measurements.

Report on THICKNESS MEASUREMENT of SHELL AND DECK PLATING (one, two or three transverse sections)

Class Identity No.

Ship's Name .....

Report No.

Sheet 5

1. This report form is to be used for recording the thickness measurement of:

Strength deck plating and sheer=strake plating transverse sections:

One, two or three sections within the cargo area comprising of the structural items (1), (2) and (3) as shown on the diagrams of typical transverse sections.

The topside area comprises deck plating, stringer plate and sheerstrake (including rounded gunwales).

The exact frame station of measurement is to be stated. The single measurements recorded are to represent the average of multiple measurements.

NOTES - See Reverse

Surveyors Signature

Report on THICKNESS MEASUREMENT of SHELL AND DECK PLATING (one, two or three transverse sections) TM2-T (ii)

Class Identity No.

Ship's Name

Report No. .....

No.   Cauged   Diminution   Dim	SVERSE SECT NUMBER Gauged D	ECTION AT FR Diminution P mm %	AT FRA	ME	_	SECO	ND TR	SECOND TRANSVERSE SECTION AT FRAME	SE SEC	TION A	TEDAN	  -	I	T Dark	ANSVER	DO DO	140	1	
STRAKE or Orig POSITION Letter Thk slow sheer strakes		Dimin P P			4			N	NUMBER		I FRAM	<u> </u>	11		Z	UMBE	I HIRD I KANSVERSE SECTION AT FRAME NUMBER	T FRAN	9
POSITION Letter Thk kelow sheer strakes	ω	E	ution	Diminution S	n or	o. r Org		Gauged	Dim	Diminution P	Diminution S	nution	S S	Org	Gauged	Ω	Diminution P	Dim	Diminution S
1st below sheer strakes 2nd 3rd 4th 5th 6th			%	% ww	Τ	压工	<u>*</u>	S	TE .	*	E E	*	7	ž	d S	<del> </del>	% uuu	Ē	*
2nd 3rd 4th 5th 6th					<u> </u>									T		H		_	L
3rd 4th 5th 6th				-	-		_	_	_	_						-			
4th 5th 6th				-	-	L	<u> </u>		L				-		-			_	_
5th 6th 2th					_			_	_								_		
6th 7th					_	<u> </u>										_			
7:7																_			
					_											_		<u> </u>	L
8th																			
hh																<u> </u>		_	
10th																			
411																			
12th																_			
13th																			
14th																			
15th																			
16th																			
17th					Н	Н													
1 <u>8</u> 1																			
19th																			
20th																			
keel strake																			
BOTTOM TOTAL						_										_			

Sheet 6

Operators Signature ......

- 1. This report form is to be used for recording the thickness measurements of:
  - Shell plating transverse sections:

One, two or three sections within the cargo area comprising of the structural items (4), (5), (6) and (7) as shown on the diagrams of typical transverse sections.

- 2. The bottom area comprises keel, bottom and bilge plating.
- 3. The exact frame station of measurement is to be stated.
- 4. The single measurements recorded are to represent the average of multiple measurements.

Report on THICKNESS MEASUREMENT of LONGITUDINAL MEMBERS (one, two or three transverse sections) **TM3-T** 

Report No.

Class Identity No.

NOTES - See Reverse THIRD TRANSVERSE SECTION AT FRAME NUMBER шш Diminution mm Gauged 弄 Org ŝ Diminution S SECOND TRANSVERSE SECTION AT FRAME NUMBER Surveyors Signature ...... E Diminution P E Gauged Org 뀵 Eg Š Diminution S FIRST TRANSVERSE SECTION AT FRAME NUMBER E Diminution Operators Signature 뎚 Gauged Org. Thk. No. STRUCTURAL MEMBER

Sheet 7

Ship's Name

1. This report form is to be used for recording the thickness measurements of:

Longitudinal Members at transverse sections:

One, two or three sections within the cargo area comprising of the appropriate structural items (8) to (2) as shown on the diagrams of typical transverse sections.

- 2. The exact frame station of measurement is to be stated.
- 3. The single measurements recorded are to represent the average of multiple measurements.

Report on THICKNESS MEASUREMENT OF TRANSVERSE STRUCTURAL MEMBERS
In the cargo and water ballast tanks within the cargo tank length

TM4-T

Ship's Nanc	. Class Identity No.	o			Repo	Report No		
TANK DESCRIPTION :								
LOCATION OF STRUCTURE:		-						
STRUCTURAL MEMBER	ITEM	Original Thickness	Gauged	ged	Diminution P	inution P	Diminution S	ution
		mm	Port	Starboard	mm	%	шш	%
						-		
	J							
					·			
Operators Signature	:	Surveyors 5	Signature	Surveyors Signature		:	NOTES - See Reverse	ee Reverse

Sheet 8

- 1. This report form is to be used for recording the thickness measurement of transverse structural members, comprising of the appropriate structural items (25) to (33) as shown on diagrams of typical transverse section.
- 2. Guidance for areas of measurement is indicated on sheets 15, 16 and 17 of this document.
- 3. The single measurements recorded are to represent the average of multiple measurements.

NOTES - See Reverse

Surveyors Signature .....

Report on THICKNESS MEASUREMENT OF W.T./TANK TRANSVERSE BULKHEADS within the chemical tank or cargo hold spaces TM5-T

Report No.

Class Identity No. ......

ANK/HOLD DESCRIPTION :							
OCATION OF STRUCTURE :				FR	FRAME No. :		
STRUCTURAL COMPONENT (plating/stiffener)	Original Thickness	Gauged	peg	Diminu P	Diminution P	Diminution S	ution
	mm	Port	Starbd	mm	%	mm	%
			·				
		•					

Sheet 9

Operators Signature ......

Ship's Name

- 1. This report form is to be used for recording the thickness measurement of W.T/O.T. transverse bulkheads.
- 2. Guidance for areas of measurement is indicated on sheets 15, 16 and 17 of this document.
- 3. The single measurement recorded are to represent the average of multiple measurements.

NOTES - See Reverse Report No. SKETCH Report on THICKNESS MEASUREMENT OF MISCELLANEOUS STRUCTURAL MEMBERS Surveyors Signature Diminution mm Diminution % Class Identity No. mm S Gauged ۵. Thk Org Operators Signature ..... LOCATION OF STRUCTURE: Description STRUCTURAL MEMBER: Ship's Name ....

Sheet 10

- 1. This report is to be used for recording the thickness measurements of miscellaneous structural members including the structural items (36), (37) and (38).
- 2. The single measurements recorded are to represent the average of multiple measurements.

### (10) (31)

Thickness Measurement—Chemical Tankers

# (13)

### Report on TM2-T (i) & (ii)

- Strength deck plating
- Stringer plate
- Sheer strake
- Side shell plating
- Bilge plating
  Bottom shell plating
- Keel plating

### Report on TW6-T

- 36. Hatch coamings
- 37. Deck plating between hatches
- 38. Hatch covers
- 39.
- 40.

### Report on TM3-T

(33)

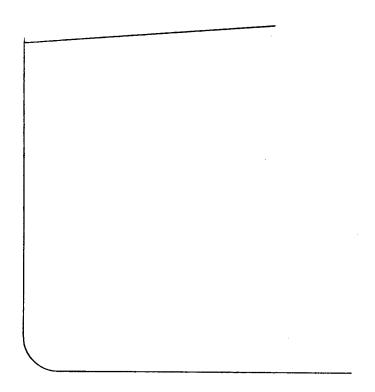
6

- Deck longitudinals
- Deck girders
- 10. Sheer strake longitudinals
- 11. Longitudinal bulkhead top strake12. Bottom longitudinals
- 13. Bottom girders
- 14. Bilge longitudinals
- 15. Longitudinal bulkhead lower strake
- 16. Side shell longitudinals
- 17. Longitudinal bulkhead plating (remainder)
- 18. Longitudinal bulkhead longitudinals
- 19. Inner bottom plating20. Inner bottom longitudinals
- 21.
- 22.
- 23. 24.

### Report on TM4-T

- 25. Deck transverse centre tank
- 26. Bottom transverse centre tank
- 27. Deck transverse wing tank
- 28. Side shell vertical web
- 29. Longitudinal bulkhead vertical web
- 30. Bottom transverse wing tank
- 31. Struts
- 32. Transverse web face plates
- 33. D.B. floors
- 34.
- 35.

### Thickness Measurement—Chemical Tankers



### Report on TM2-T (i) & (ii)

- Strength deck plating
- Stringer plate
- Sheer strake Side shell plating
- 5.
- Bilge plating
  Bottom shell plating
- Keel plating

### Report on TW6-T

- 36. Hatch coamings
- 37. Deck plating between hatches
- 38. Hatch covers
- 39. 40.

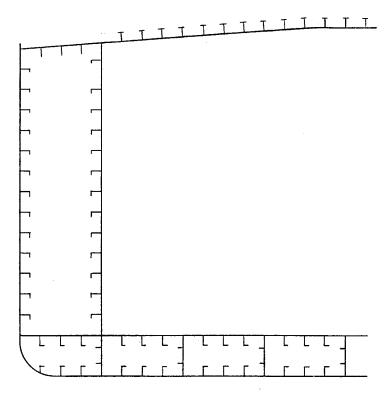
- Report on TM3-T

  8. Deck longitudinals
- Deck girders
- 10. Sheer strake longitudinals
- 11. Longitudinal bulkhead top strake
- 12. Bottom longitudinals
- 13. Bottom girders
- 14. Bilge longitudinals
- 15. Longitudinal bulkhead lower strake
- 16. Side shell longitudinals
- 17. Longitudinal bulkhead plating (remainder)
- 18. Longitudinal bulkhead longitudinals
- 19. Inner bottom plating
  20. Inner bottom longitudinals
- 21. 22.
- 23.
- 24.

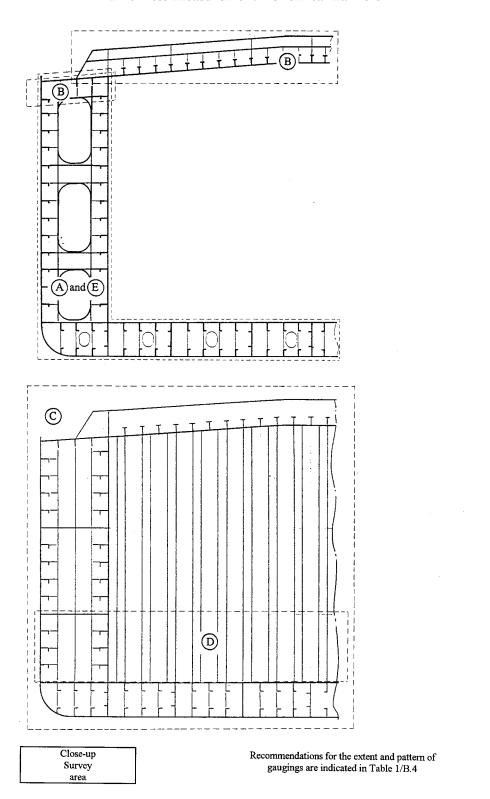
### Report on TM4-T

- 25. Deck transverse centre tank
- 26. Bottom transverse centre tank
- 27. Deck transverse wing tank
- 28. Side shell vertical web
- 29. Longitudinal bulkhead vertical web30. Bottom transverse wing tank
- 31. Struts
- 32. Transverse web face plates
- 33. D.B. floors
- 34.
- 35.

### Thickness Measurement—Chemical Tankers



### Thickness Measurement—Chemical Tankers



Sheet 14

Appendix 1/D annex 1/D.2
Guidelines for Technical Assessment
in Conjunction with
Planning for Enhanced Surveys of Chemical
Tankers
Special Survey-Hull

## ANNEX 1/D.2 Guidelines for Technical Assessment in Conjunction with Planning for Enhanced Surveys of Chemical Tankers Special Survey-Hull

### 1.0 Introduction

These guidelines contain information and suggestions concerning technical assessments which may be of use in conjunction with the planning of enhanced special surveys of chemical tankes. As indicated in 1/D.5.1.5 of Appendix 1/D, "Hull Surveys of Chemical Tankers," the guidelines are a recommended tool which may be made mandatory by the Bureau, when considered necessary and appropriate, in conjunction with the preparation of the required Survey Plan.

### 2.0 Purpose and Principles

### 2.1 Purpose

The purpose of the technical assessments described in these guidelines is to assist in identifying critical structural areas, nominating suspect areas and in focusing attention on structural elements or areas of structural elements which may be particularly susceptible to, or evidence a history of, wastage or damage. This information may be useful in nominating locations, areas and tanks for thickness measurement, close-up survey and tank testing.

### 2.2 Minimum Requirements

However, these guidelines may not be used to reduce the requirements pertaining to thickness measurement, close-up survey and tank testing contained in Tables 1/D.1, 1/D.2 and 1/D.3, respectively, of Appendix 1/D; which are, in all cases, to be complied with as a minimum.

### 2.3 Timing

As with other aspects of survey planning, the technical assessments described in these guidelines should be worked out by the Owner or operator in cooperation with the Classification Society well in advance of the commencement of the Special Survey, i.e., prior to commencing the survey and normally at least 12 to 15 months before the survey's completion due date.

### 2.4 Aspects to be Considered

Technical assessments, which may include quantitative or qualitative evaluation of relative risks of possible deterioration, of the following aspects of a particular ship may be used as a basis for the nomination of holds, tanks and areas for survey:

• Design features such as stress levels on various structural elements, design details and extent of use of high tensile steel.

- Former history with respect to corrosion, cracking, buckling, indents and repairs for the particular ship as well as similar vessels, where available.
- Information with respect to types of cargo carried, use of different tanks for cargo/ballast, protection of tanks and conditions of coating, if any.

Technical assessments of the relative risks of susceptibility to damages or deterioration of various structural elements and areas should be judged and decided on the basis of recognized principles and practices, such as may be found in publications of the Tanker Structure Cooperative Forum (TSCF), (Refs. 2 and 3).

### 3.0 Technical Assessment

### 3.1 General

There are three basic types of possible failure which may be the subject of technical assessment in connection with planning of surveys; corrosion, cracks and buckling. Contact damages are not normally covered by the survey plan since indents are usually noted in survey reports and assumed to be dealt with as a normal routine by Surveyors.

Technical assessments performed in conjunction with the survey planning process, should in principle be carried out as shown schematically in Figure 1. The approach is based on an evaluation of experience and knowledge basically related to:

- Design
- Corrosion

The design should be considered with respect to structural details which may be susceptible to buckling or cracking as a result of vibration, high stress levels or fatigue.

Corrosion is related to the ageing process, and is closely connected with the quality of corrosion protection at newbuilding, and subsequent maintenance during the service life. Corrosion may also lead to cracking and/or buckling.

### 3.2 Methods

### **3.2.1** Design Details

Damage experience related to the ship in question and similar ships, where available, is the main source of information to be used in the process of planning. In addition, a selection of structural details from the design drawings should be included.

Typical damage experience to be considered will consist of:

- Number, extent, location and frequency of cracks.
- Location of buckles.

This information may be found in the survey reports and/or the Owner's files, including the results of the Owner's own inspections. The defects should be analyzed, noted and marked on sketches.

In addition, general experience should be utilized. For example, reference should be made to TSCF's "Guidance Manual for the Inspection and Condition Assessment of Tanker Structures," (Ref. 2), which contains a catalogue of typical damages and proposed repair methods for various tanker structural details.

Such figures should be used together with a review of the main drawings, in order to compare with the actual structure and search for similar details which may be susceptible to damage. An example is shown in Figure 2.

The review of the main structural drawings, in addition to using the above mentioned figures, should include checking for typical design details where cracking has been experienced. The factors contributing to damage should be carefully considered.

The use of high tensile steel (HTS) is an important factor. Details showing good service experience where ordinary, mild steel has been used may be more susceptible to damage when HTS, and its higher associated stresses, are utilized. There is extensive and, in general, good experience, with the use of HTS for longitudinal material in deck and bottom structures. Experience in other locations, where the dynamic stresses may be higher, is less favorable, e.g. side structures.

In this respect, stress calculations of typical and important components and details, in accordance with the latest Rules or other relevant methods, may prove useful and should be considered.

The selected areas of the structure identified during this process should be recorded and marked on the structural drawings to be included in the Survey Plan.

### 3.2.2 Corrosion

In order to evaluate relative corrosion risks, the following information is generally to be considered:

- Usage of Tanks, Holds and Spaces
- Condition of Coatings
- Condition of Anodes
- Cleaning Procedures
- Previous Corrosion Damage
- Ballast use and time for Cargo Holds
- Corrosion Risk Scheme (See Ref. 3, Table 3.1)
- Location of Heated Tanks

Ref. 3 gives definitive examples which can be used for judging and describing coating condition, using typical pictures of conditions.

The evaluation of corrosion risks should be based on information in Ref. 3, together with relevant information on the age of the ship and the anticipated condition of the ship as derived from the information collected in order to prepare the Survey Plan.

The various tanks, holds and spaces should be listed with the corrosion risks nominated accordingly.

**3.2.3** Locations for Close-up Survey and Thickness Measurement

On the basis of the table of corrosion risks and the evaluation of design experience, the locations for initial close-up survey and thickness measurement (sections) may be nominated.

The sections subject to thickness measurement should normally be nominated in tanks and spaces where corrosion risk is judged to be the highest.

The selection of tanks, holds and spaces for close-up survey should, initially, be based on highest corrosion risk, and should always include ballast tanks. The principle for the selection should be that the extent is increased by age or where information is insufficient or unreliable.

### References

- 1. IACS Unified Requirements Z10.3, "Hull Surveys of Chemical Tankers."
- 2. TSCF, "Guidance Manual for the Inspection and Condition Assessment of Tanker Structures."
- 3. TSCF, "Condition Evaluation and Maintenance of Tanker Structures."

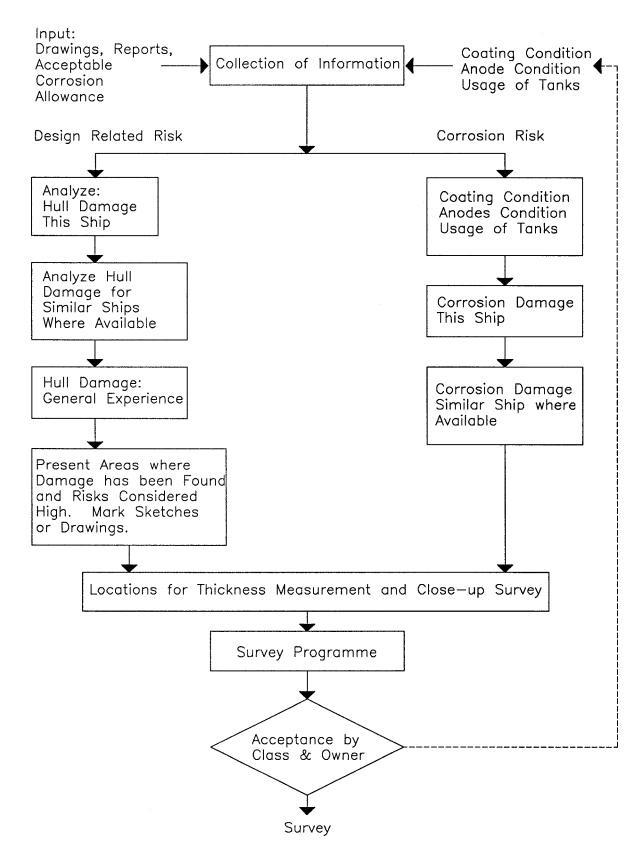


FIGURE 1: TECHNICAL ASSESSMENT AND THE SURVEY PLANNING PROCESS

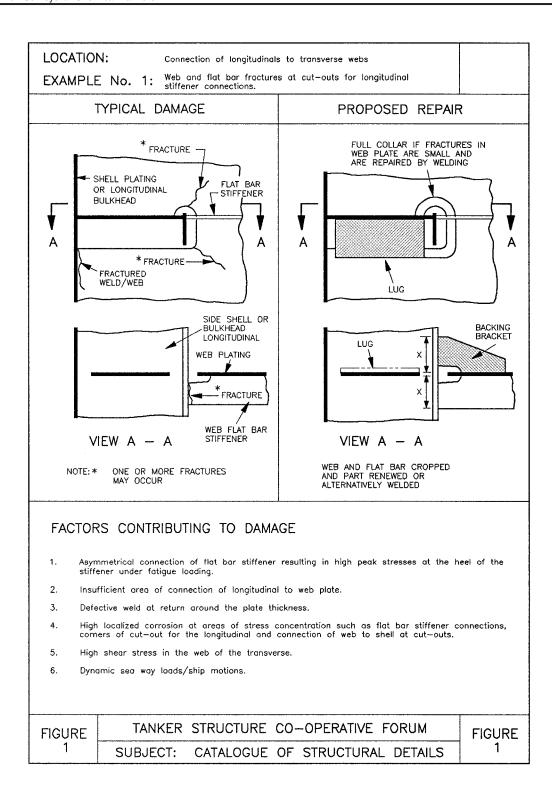


FIGURE 2: TYPICAL DAMAGE AND REPAIR EXAMPLE (REPRODUCED FROM REF. 2)